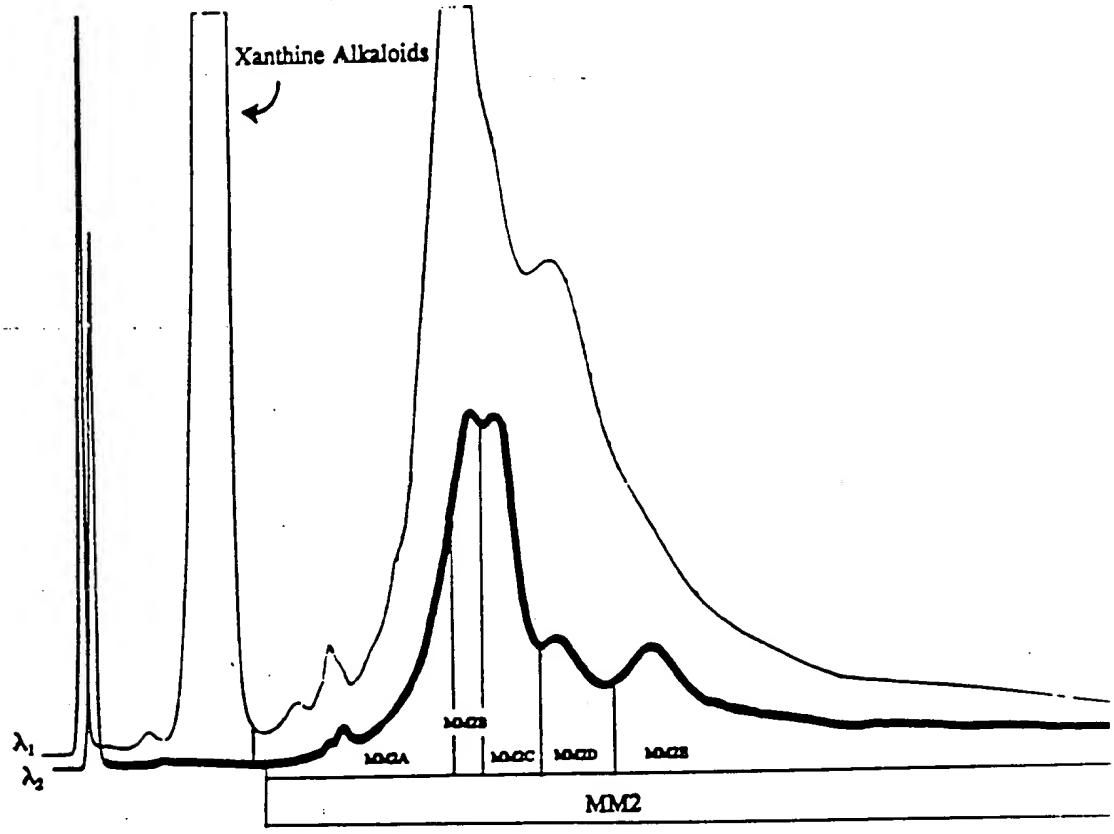
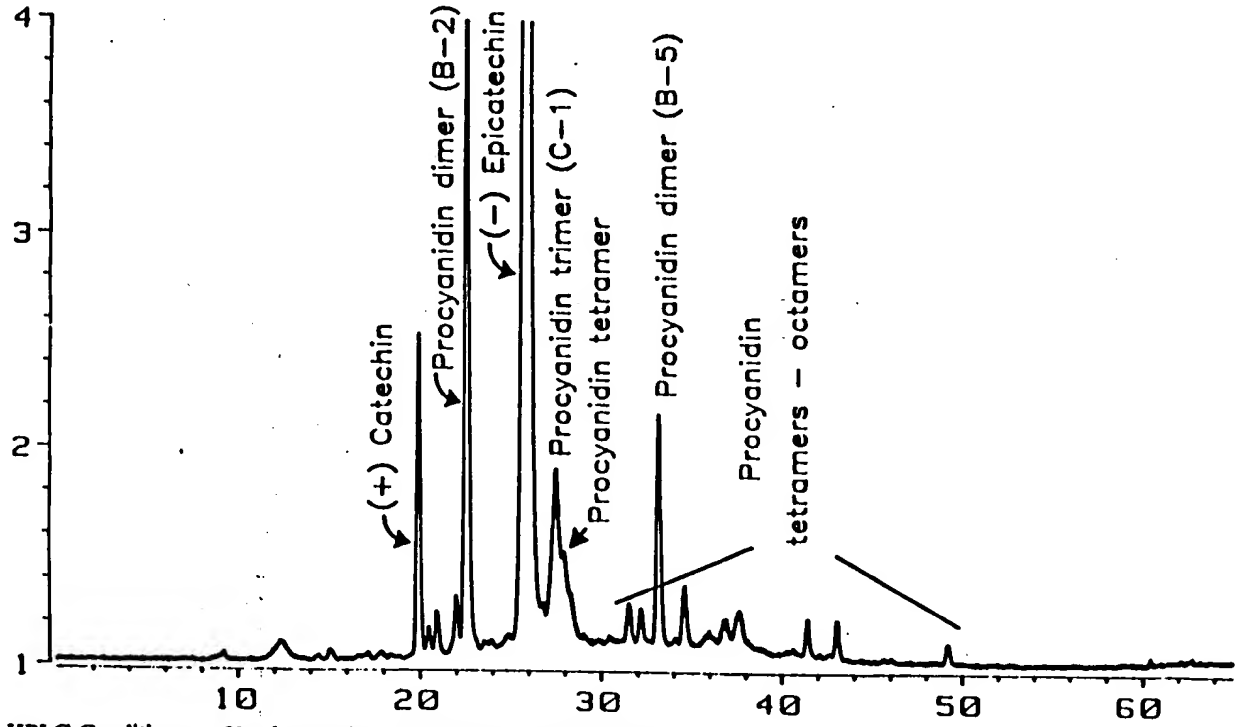
Figure 1: Gel Permeation Chromatogram of Crude Procyanidins on Sephadex LH-20



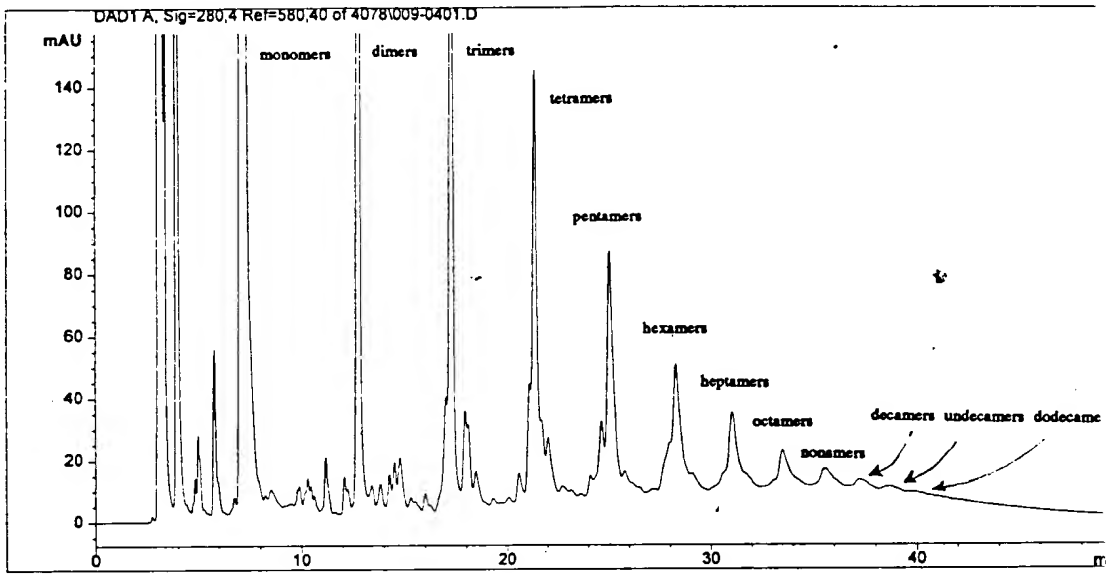
Chromatographic Conditions: Column; 28 x 2.5 cm Sephadex LH-20, Mobile Phase: Methanol/Water Step Gradient, 15:85, 25:75, 35:65, 70:30, 100:0 Stepped at 1/2 Hour Intervals, Flow Rate; 1.5 ml/min, Detector; UV @ λ_1=254 nm and λ_2=365 nm, Chart Speed; 0.5 mm/min, Column Load; 120 mg.

Figure 2 A: Elution Profile of Cocoa Procyanidins Extracted from UIT-1 Unfermented Cocoa



HPLC Conditions: Hewlett Packard 1090 Ternary HPLC System Equipped with HP Model 1046A Programmable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm);
Linear Gradient of 60% B into A at a Flow Rate of 0.3 ml/min,
B=0.5% Acetic Acid in Methanol; A=0.5% Acetic Acid in Deionized Water.
λ_{ex}=280 nm; λ_{em}=316 nm

Figure 2B. **Analytical Normal Phase HPLC Separation of Cocoa Procyanidins**



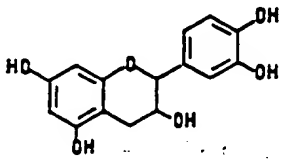
HPLC Conditions:

250 x 3.2mm Lichrosphere 5 Silica column (5μ)
20 x 4.6mm Supelguard LC-Si (5μ) guard column
Detector: Photodiode Array @ 280nm

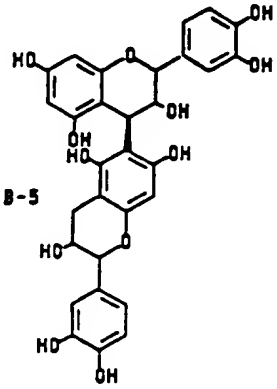
Gradient: Time (min.)	CH_2Cl_2	Methanol	Acetic Acid/Water (1:1)
0	82	14	4
30	67.6	28.4	4
60	46	50	4
65	10	86	4
70	10	86	4

Flow rate: 0.5 mL/min
Column Temperature: 37°C

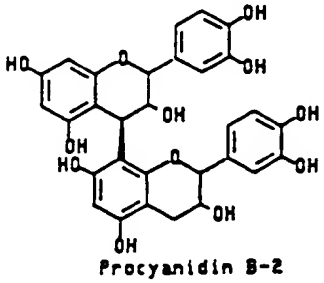
Figure 3: Representative Structures of Cocoa Procyanidins



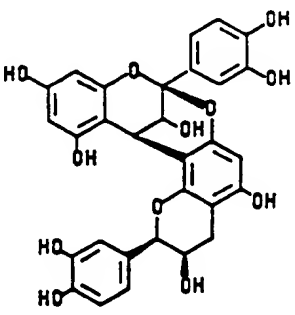
(-) Epicatechin



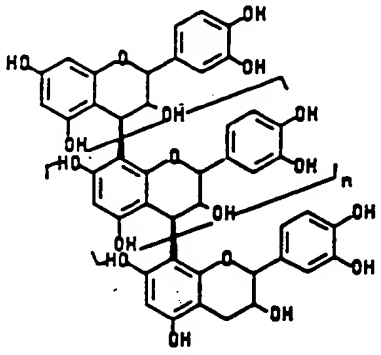
Procyanidin B-5



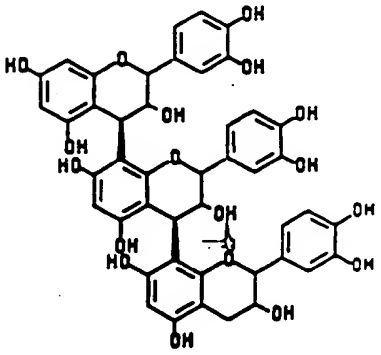
Procyanidin B-2



Procyanidin A-2



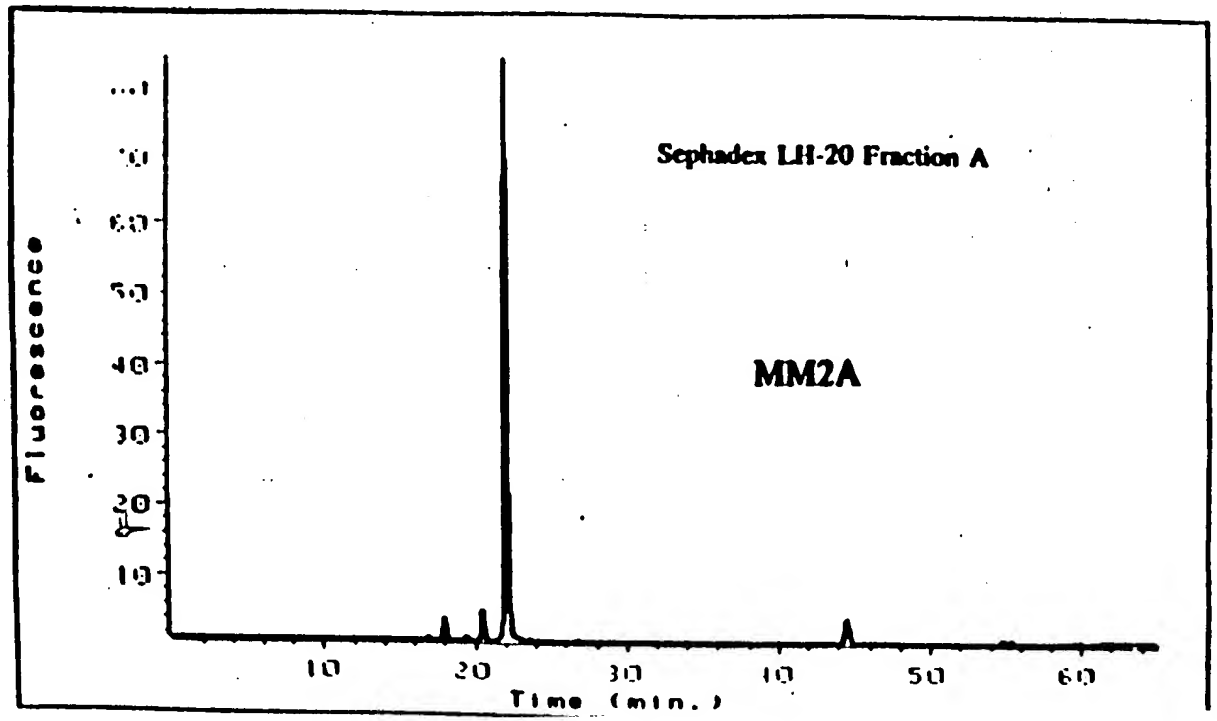
Procyanidin Oligomers n = 2 through 5



Procyanidin C-1

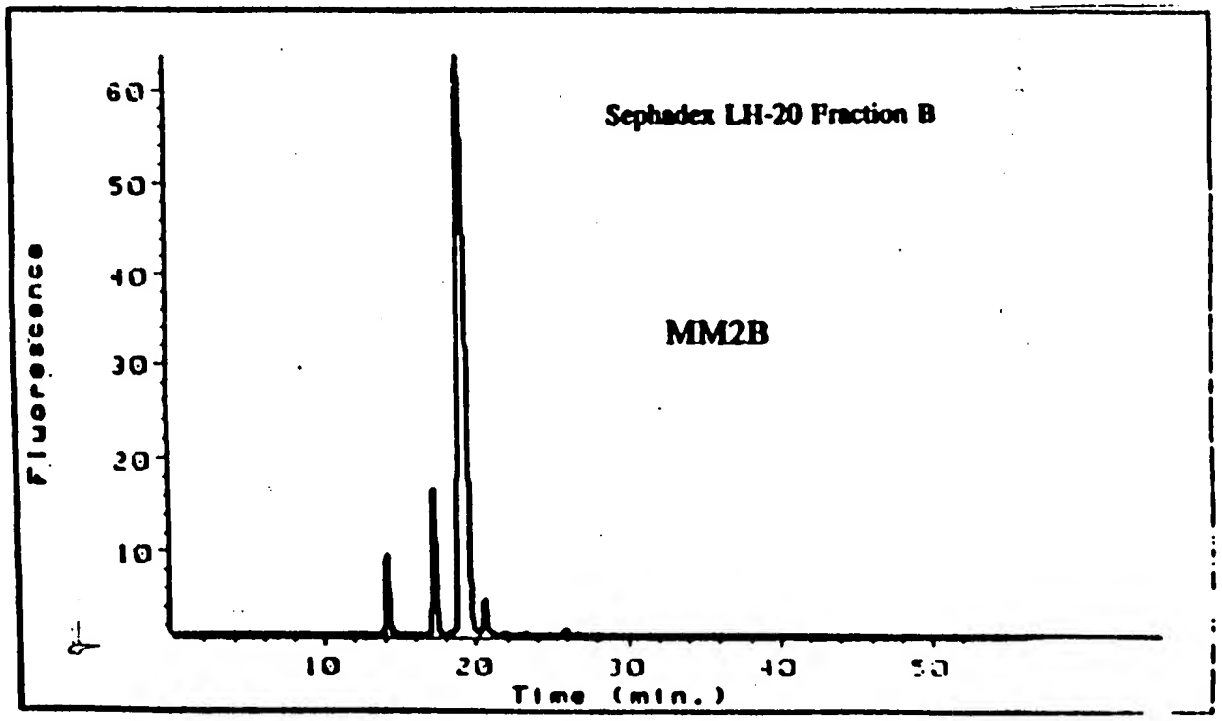
HPLC Conditions: Hewlett Packard 1090 ternary HPLC System equipped with HP Model 1046A Programable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm)
Linear gradient of 60% B into A at a flow rate of 0.3 ml/min. B=0.5% acetic acid in methanol; A=0.5% acetic acid in deionized water. λ_{ex}=280nm; λ_{em}=316nm

Figure 4A Representative HPLC Traces of Procyanidin Fraction



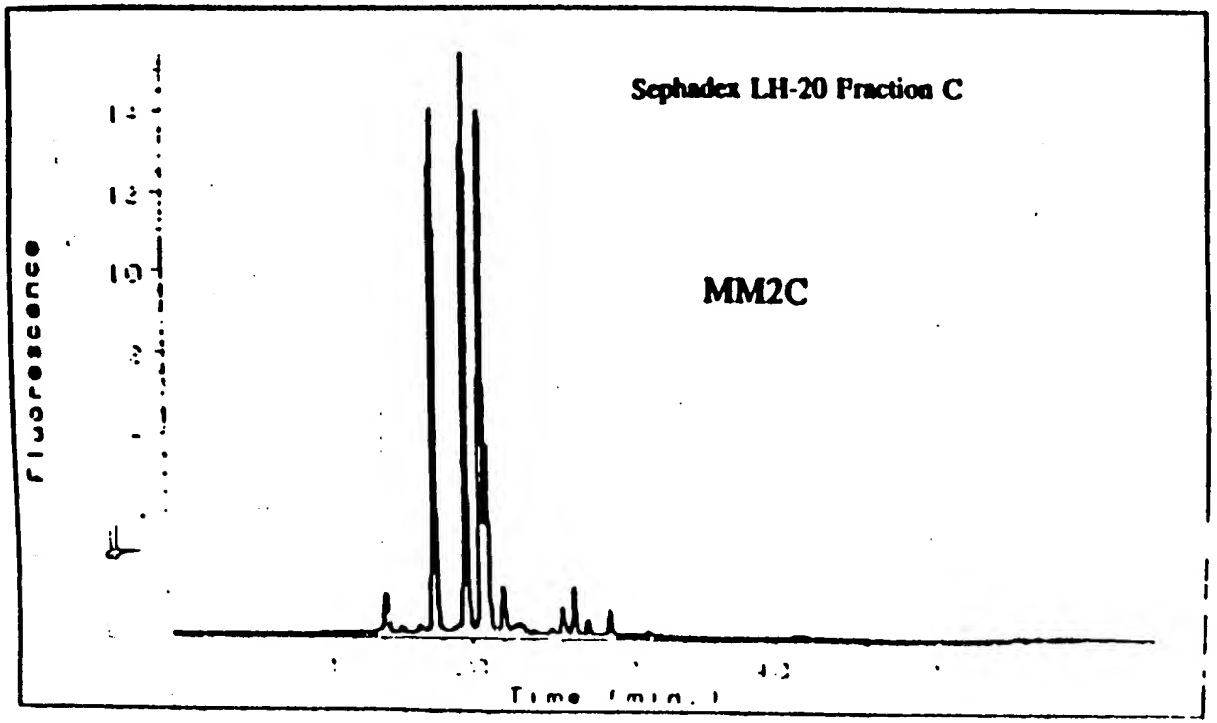
HPLC Conditions: Hewlett Packard 1090 ternary HPLC System equipped with HP Model 1046A Programable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm)
Linear gradient of 60% B into A at a flow rate of 0.3 ml/min. B=0.5% acetic acid in methanol; A=0.5% acetic acid in deionized water. λ_{ex}=280nm; λ_{em}=316nm

Figure 4B Representative HPLC Traces of Procyanidin Fractions



HPLC Conditions: Hewlett Packard 1090 ternary HPLC System equipped with HP Model 1046A Programable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm)
Linear gradient of 60% B into A at a flow rate of 0.3 ml/min. B=0.5% acetic acid in methanol; A=0.5% acetic acid in deionized water. λ_{ex}=280nm; λ_{em}=316nm

Figure 4C Representative HPLC Traces of Procyanidin Fractions



HPLC Conditions: Hewlett Packard 1090 ternary HPLC System equipped with HP Model 1046A Programable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm)
Linear gradient of 60% B into A at a flow rate of 0.3 ml/min. B=0.5% acetic acid in methanol; A=0.5% acetic acid in deionized water. λ_{ex}=280nm; λ_{em}=316nm

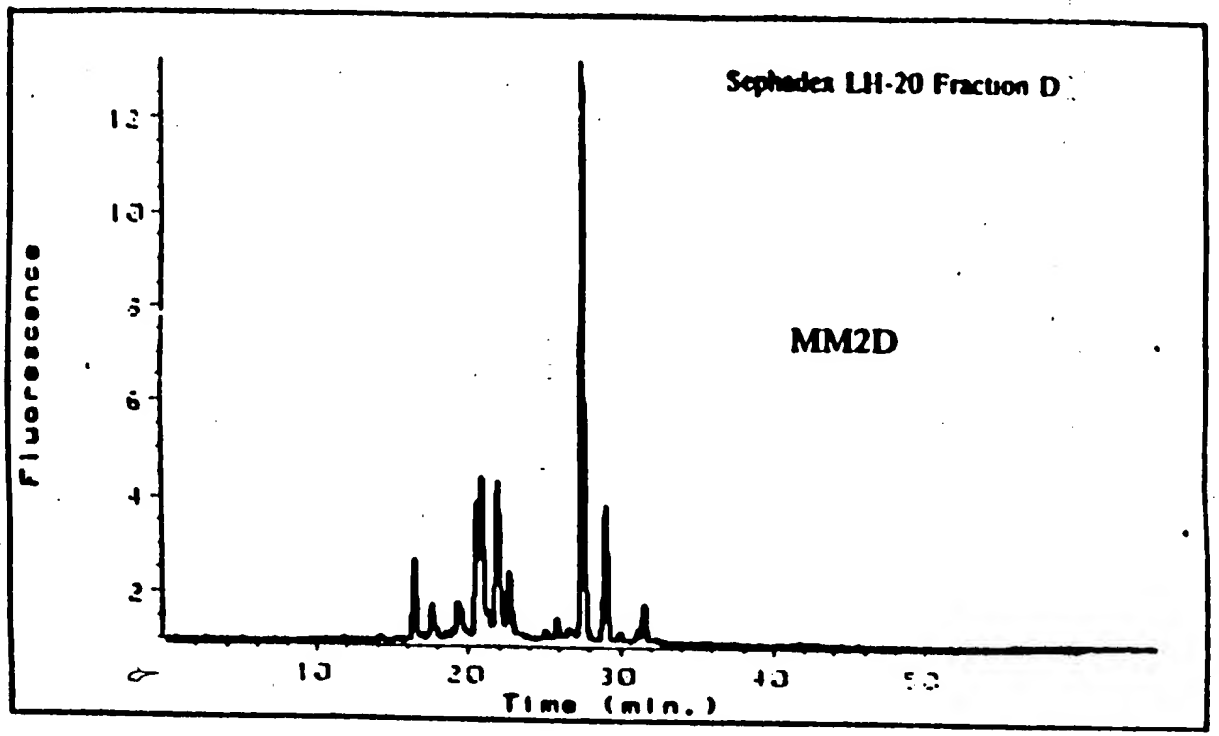


Figure 4D Representative HPLC Traces of Procyanidin Fractions

HPLC Conditions: Hewlett Packard 1090 ternary HPLC System equipped with HP Model 1046A Programable Fluorescence Detector.
Column: 5μ Hypersil ODS (200 x 2.1 mm)
Linear gradient of 60% B into A at a flow rate of 0.3 ml/min. B=0.5% acetic acid in methanol; A=0.5% acetic acid in deionized water. λ_{ex}=280nm; λ_{em}=316nm

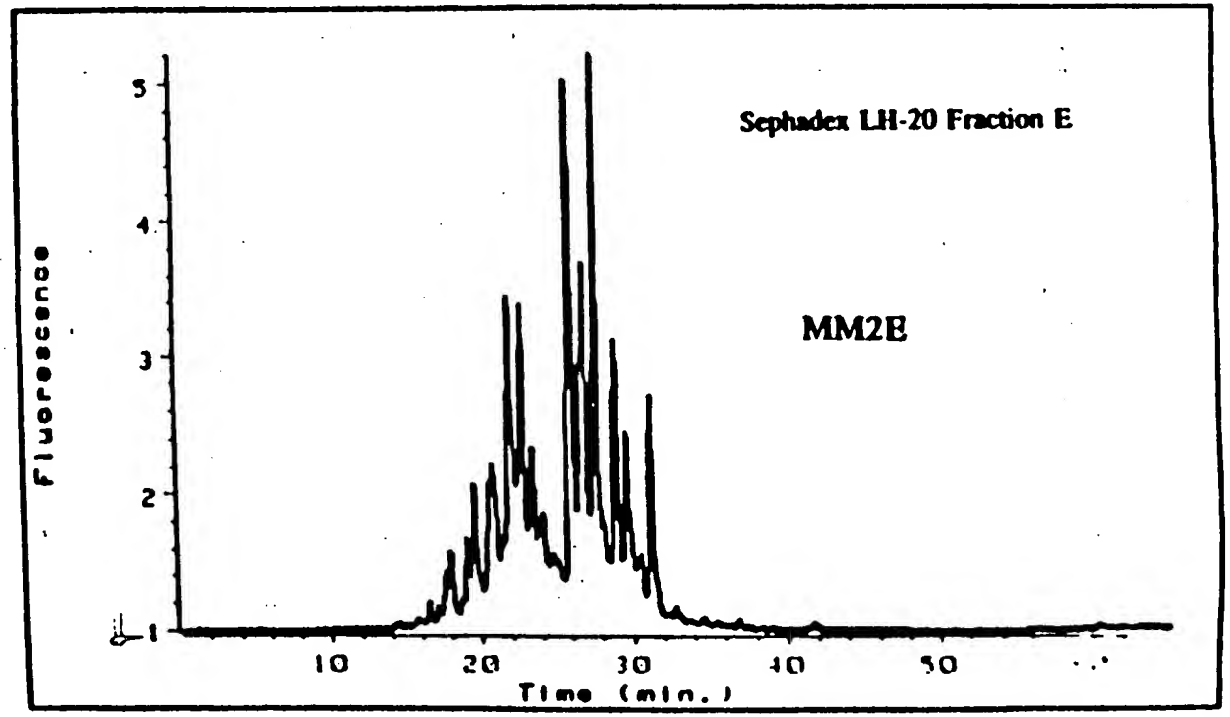
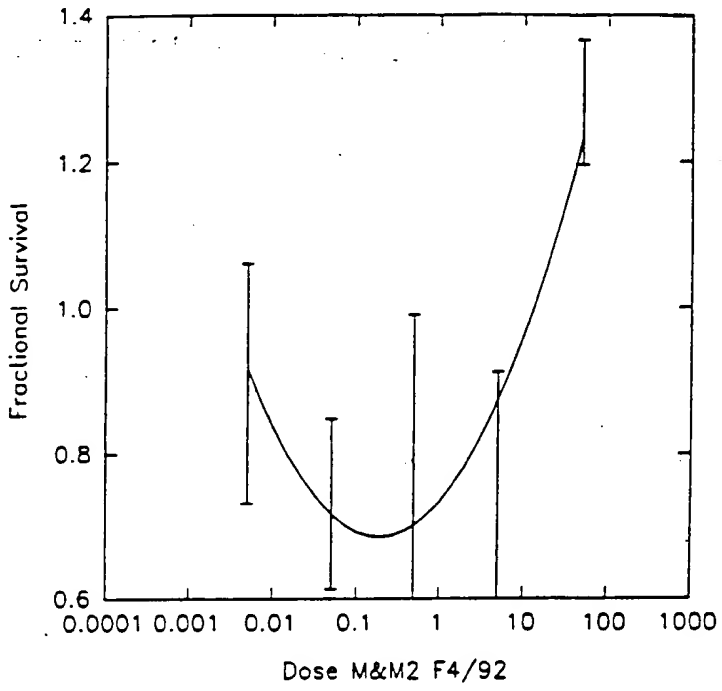


Figure 4E Representative HPLC Traces of Procyanidin Fractions

Figure 5: Dose - Response Relationship Between Amount MM2 and ACHN Survival



μg/mL MM2

Figure 6A **Dose-Response Relationships Between Combinations of Procyanidin Fractions and PC-3 Cancer Cell Line**

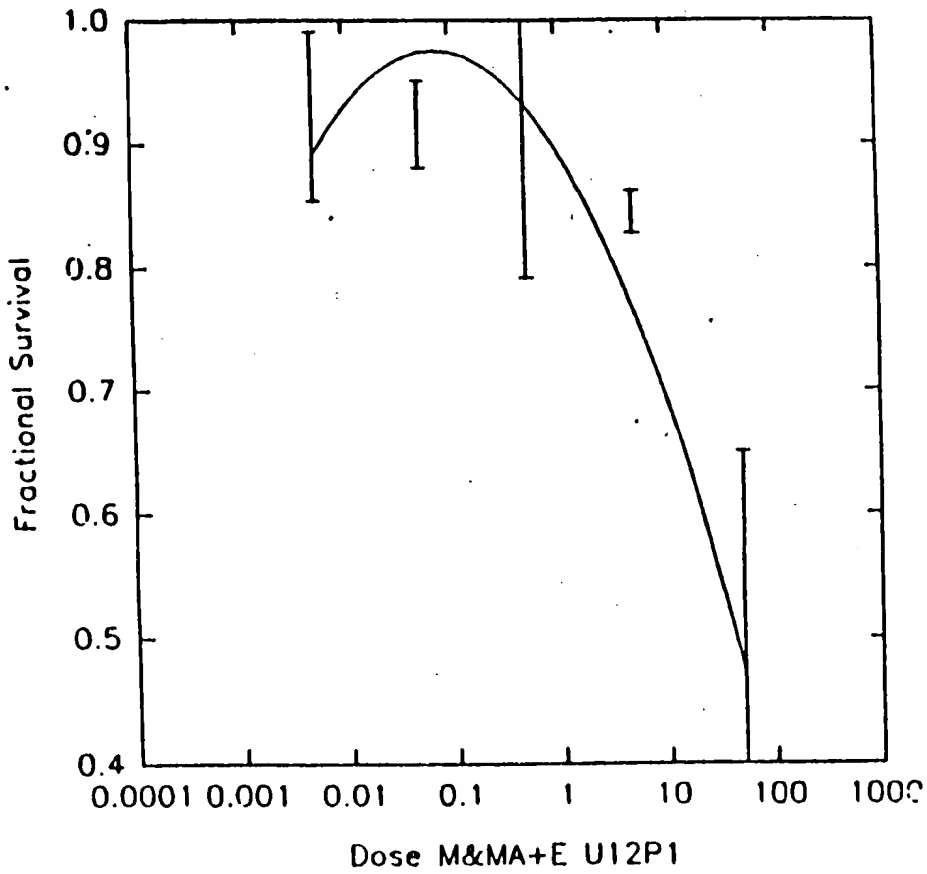


Figure 6B **Dose-Response Relationships Between Combinations of Procyanidin Fractions and PC-3 Cancer Cell Line**

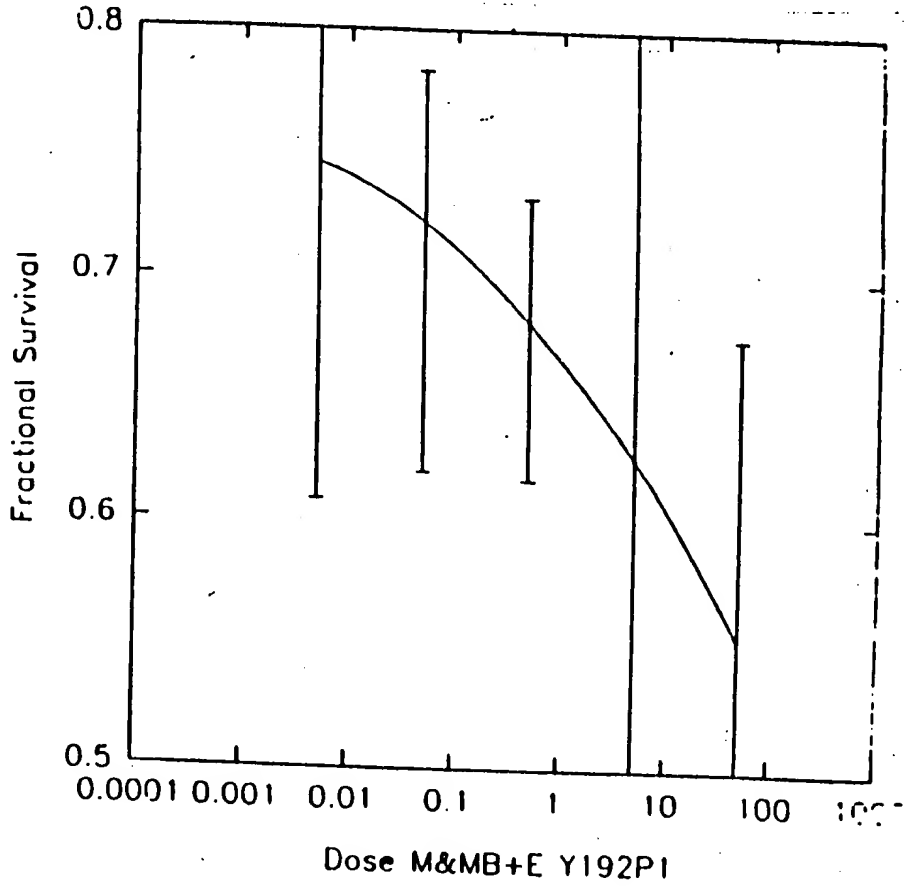


Figure 6C **Dose-Response Relationships Between Combinations of Procyanidin Fractions and PC-3 Cancer Cell Line**

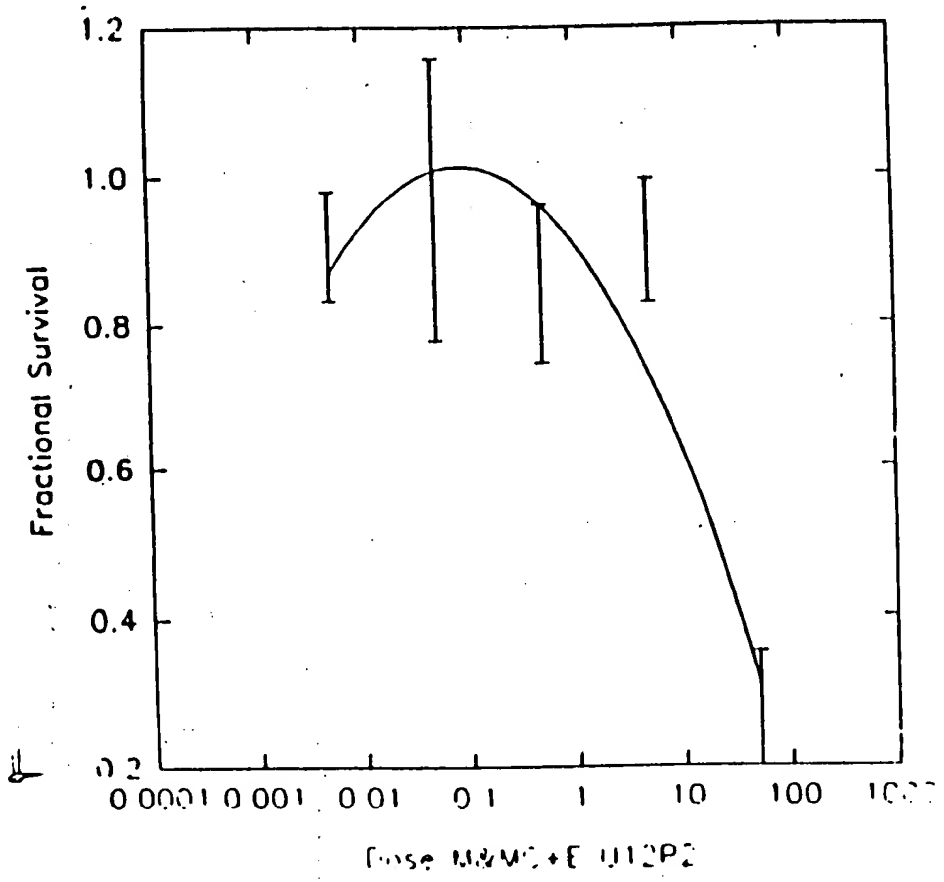


Figure 6D **Dose-Response Relationships Between Combinations of Procyanidin Fractions and PC-3 Cancer Cell Line**

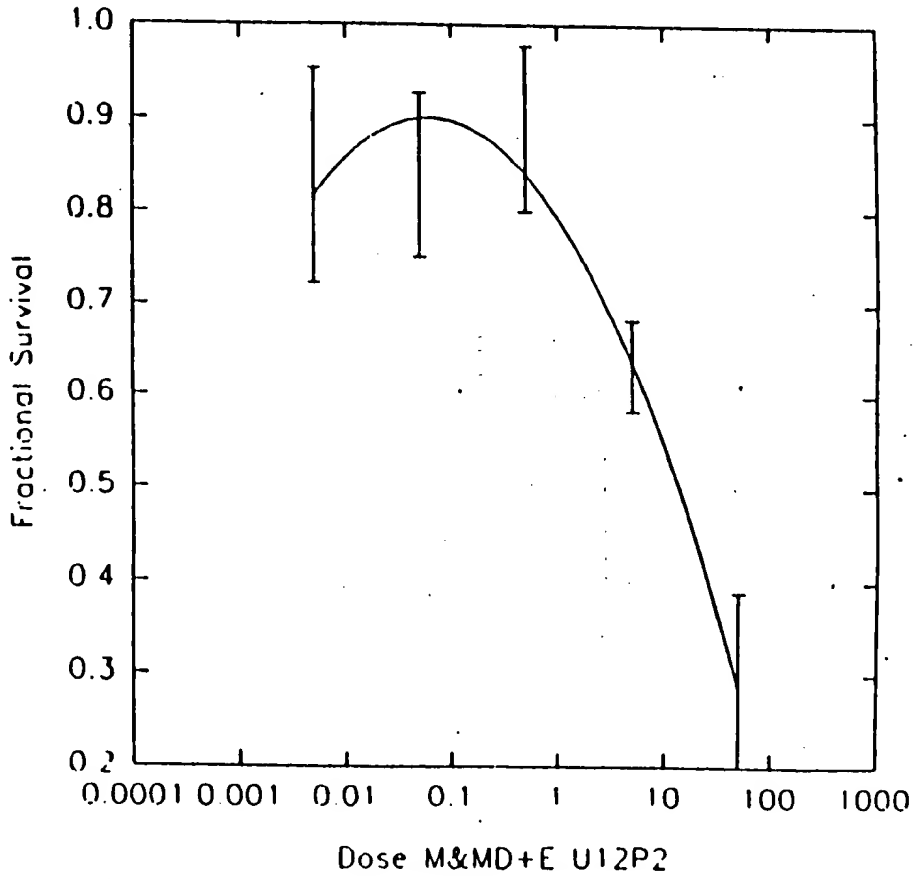


Figure 7A

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the PC-3 Prostate Cell Line

Individual Procyanidin Fractions

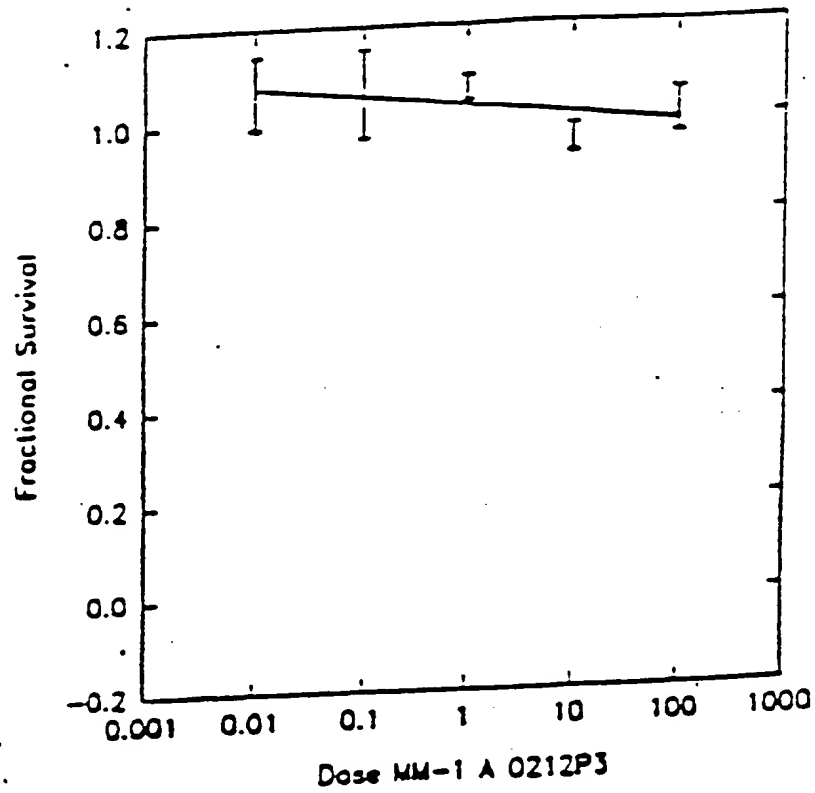


Figure 7B

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the PC-3 Prostate Cell Line

Individual Procyanidin Fractions

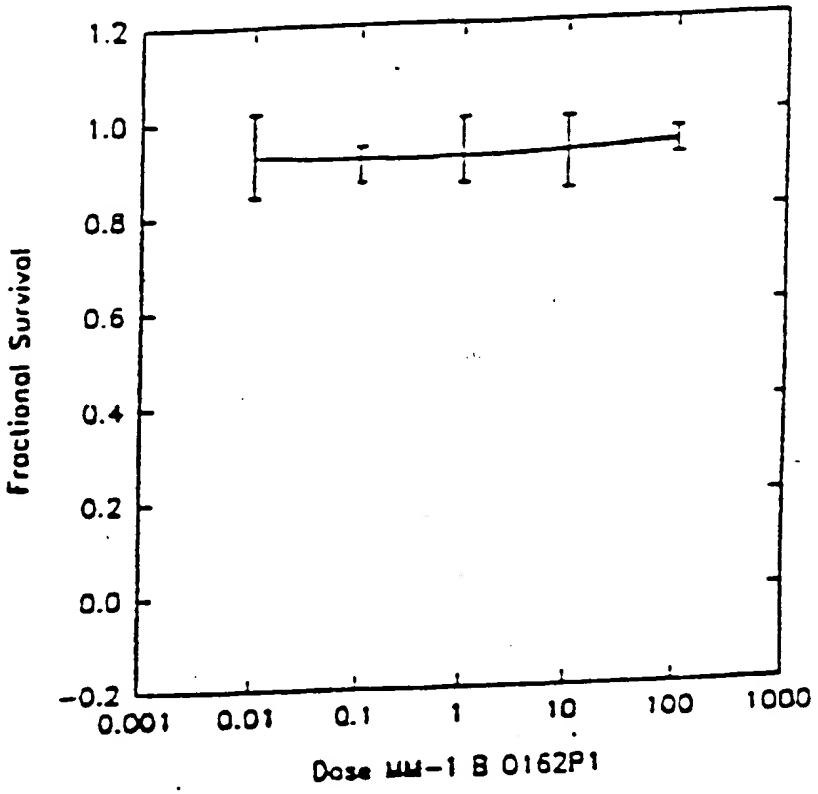


Figure 7C

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the PC-3 Prostate Cell Line

Individual Procyanidin Fractions

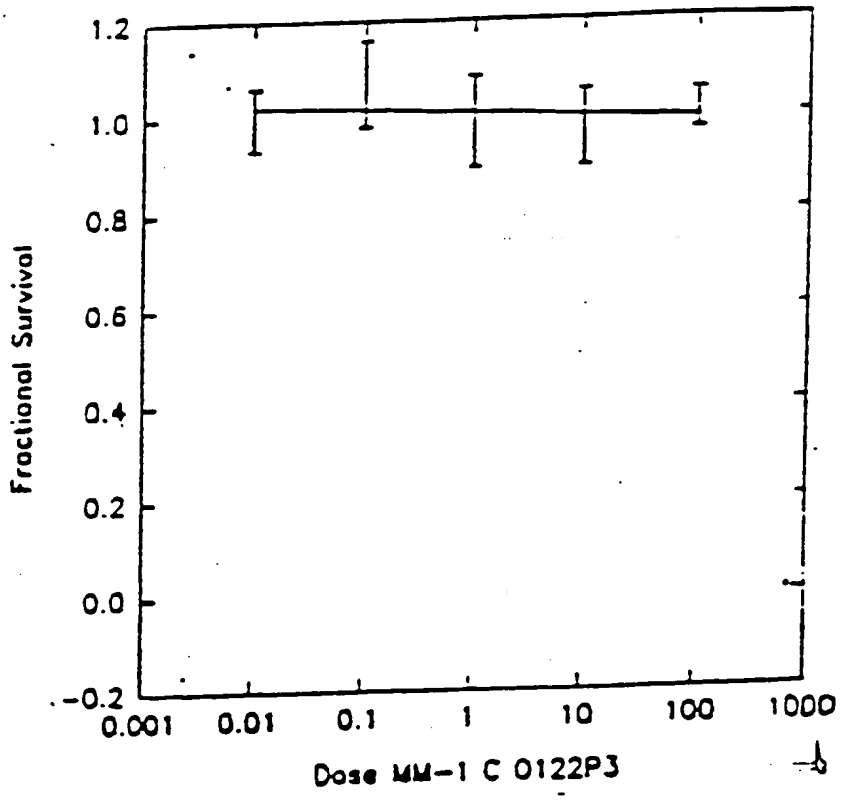


Figure 7D

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the PC-3 Prostate Cell Line

Individual Procyanidin Fractions

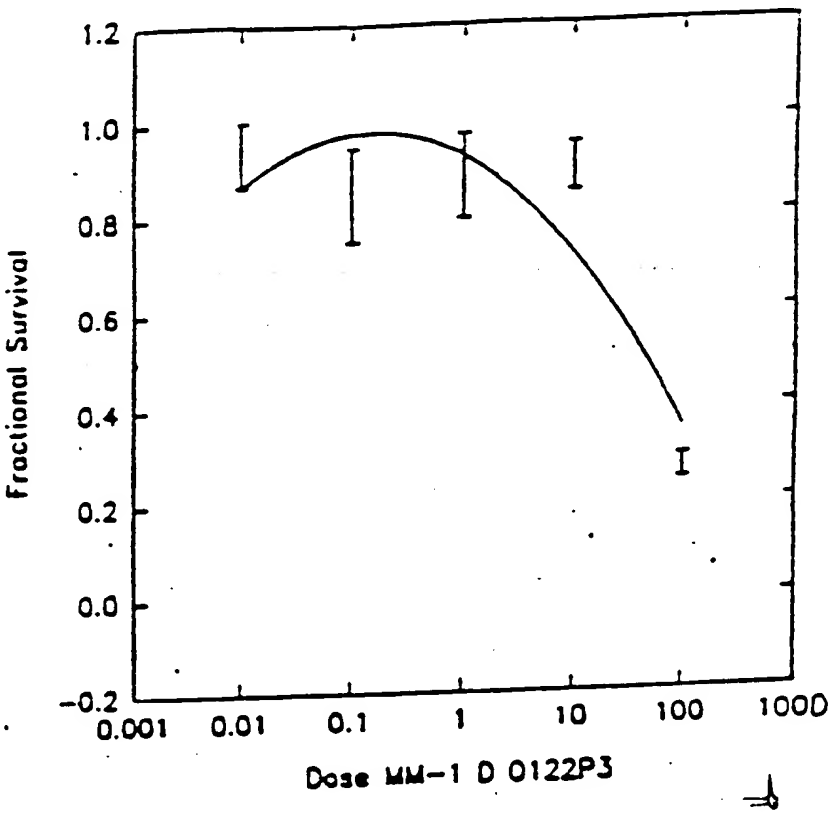


Figure 7E

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the PC-3 Prostate Cell Line

Individual Procyanidin Fractions

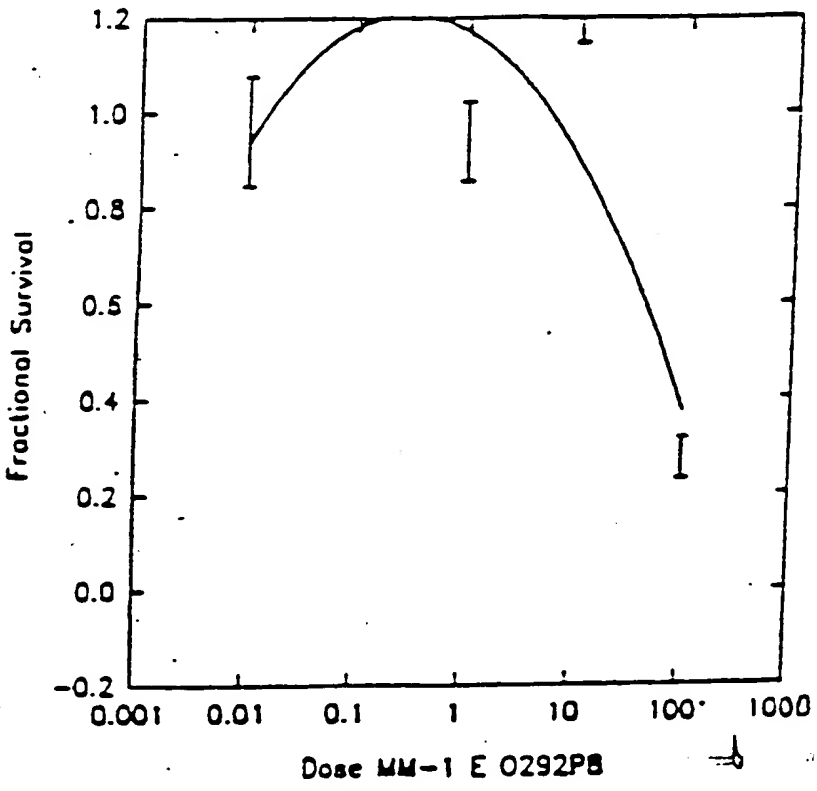


Figure 8A

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the KB Nasopharyngeal/HeLa Cell Line

Individual Procyanidin Fractions

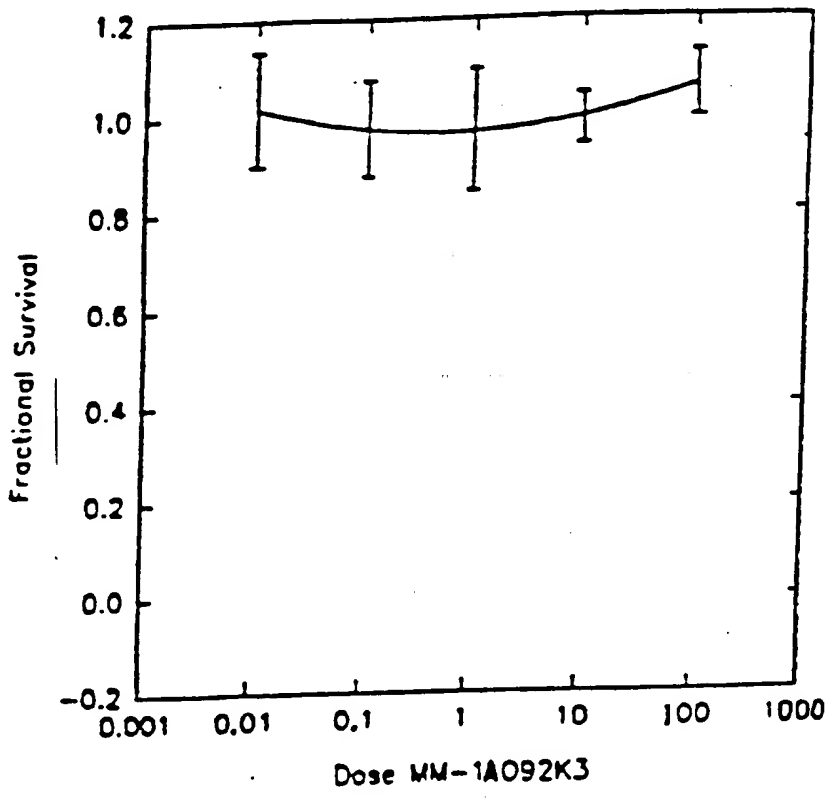


Figure 8B

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the KB Nasopharyngeal/HeLa Cell Line

Individual Procyanidin Fractions

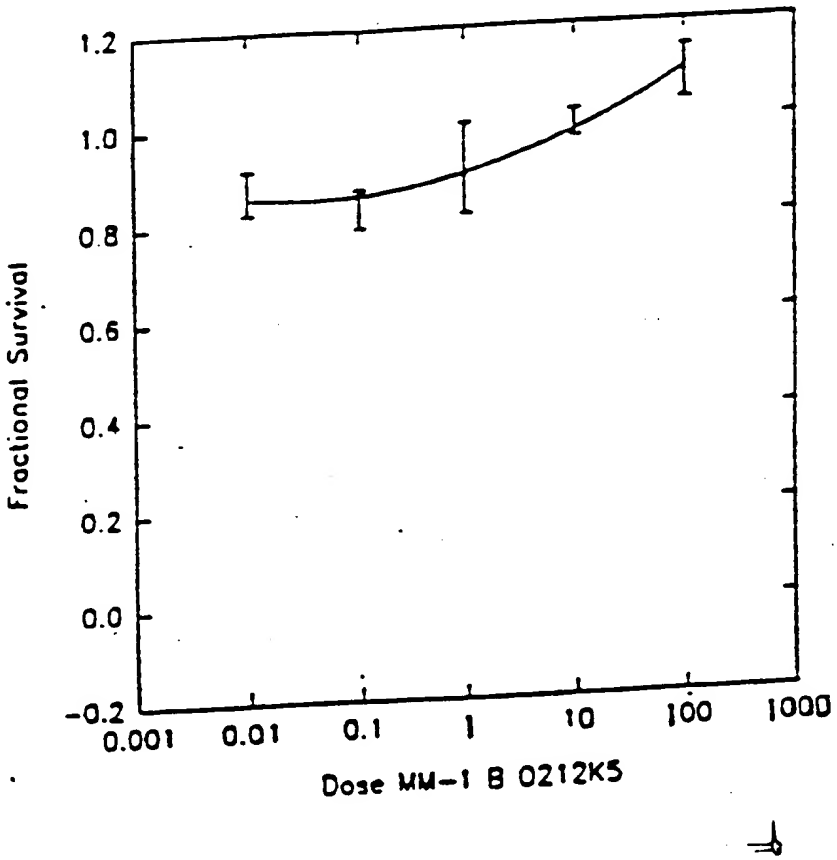


Figure 8C

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the KB Nasopharyngeal/HeLa Cell Line

Individual Procyanidin Fractions

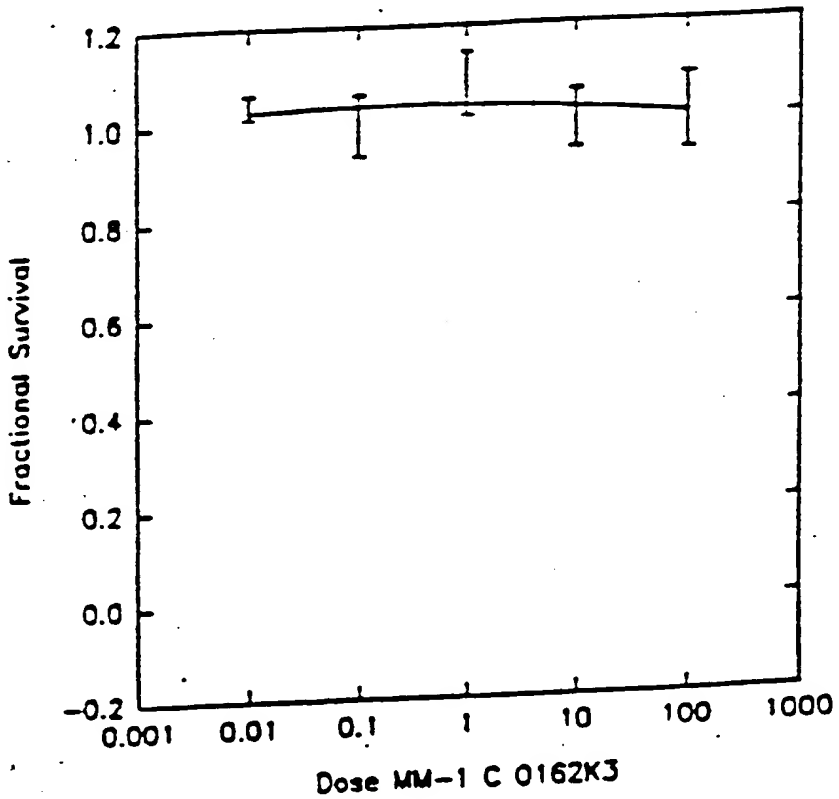


Figure 8D

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the KB Nasopharyngeal/HeLa Cell Line

Individual Procyanidin Fractions

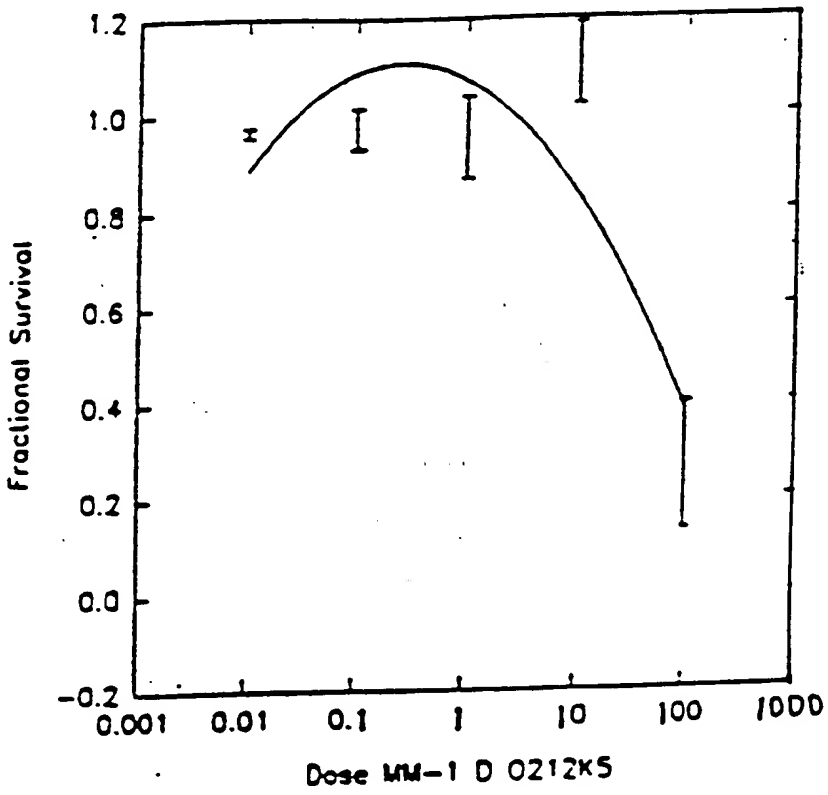


Figure 9B

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Individual Procyanidin Fractions

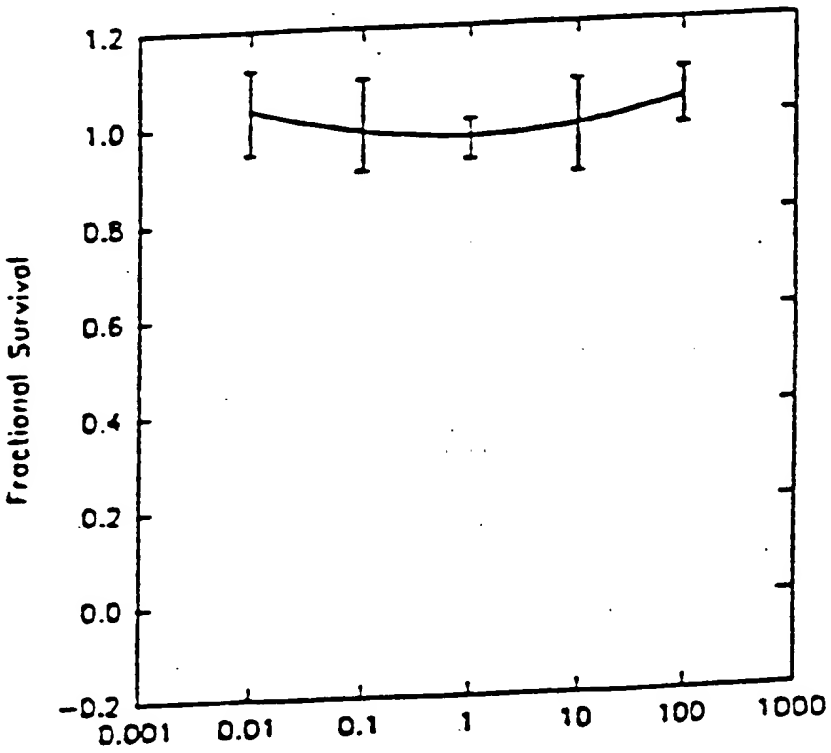


Figure 9C

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Individual Procyanidin Fractions

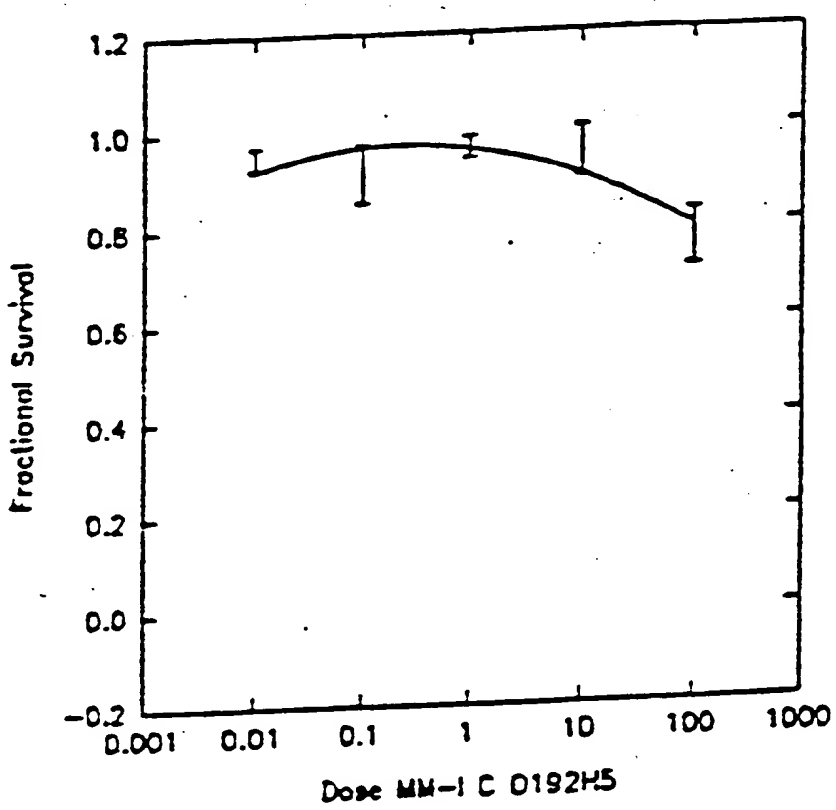


Figure 9D

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Individual Procyanidin Fractions

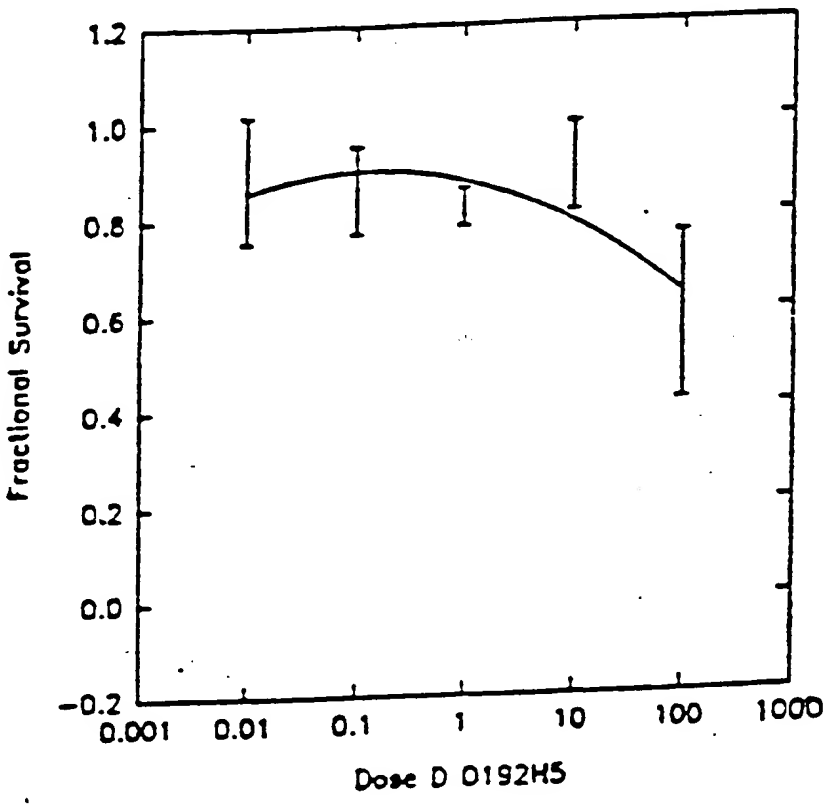


Figure 9E

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Individual Procyanidin Fractions

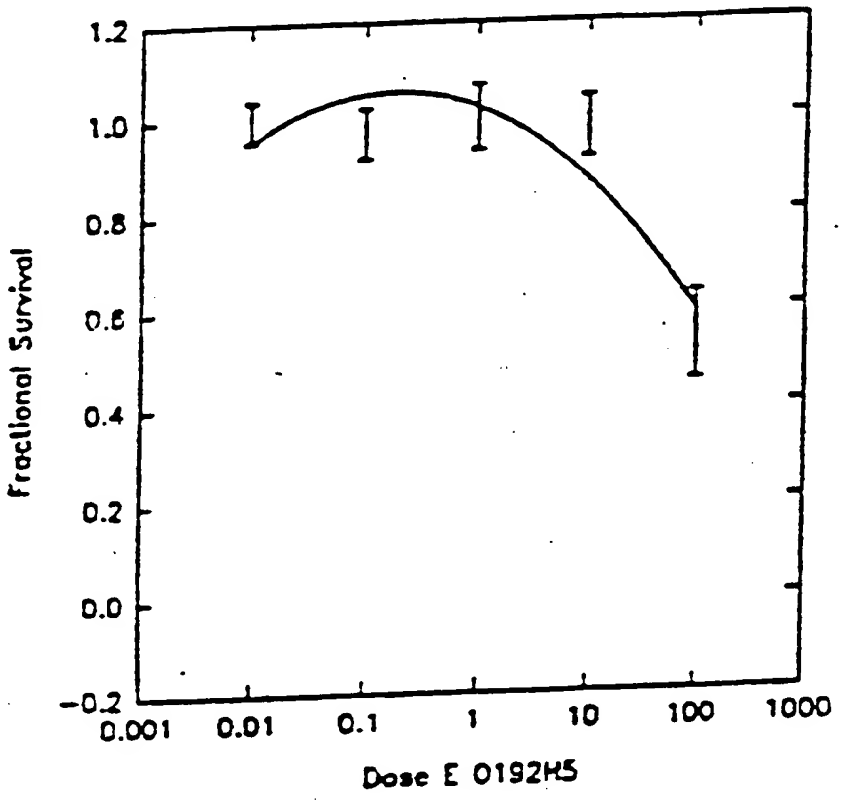


Figure 9F

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Representative Procyanidin Fraction Combinations

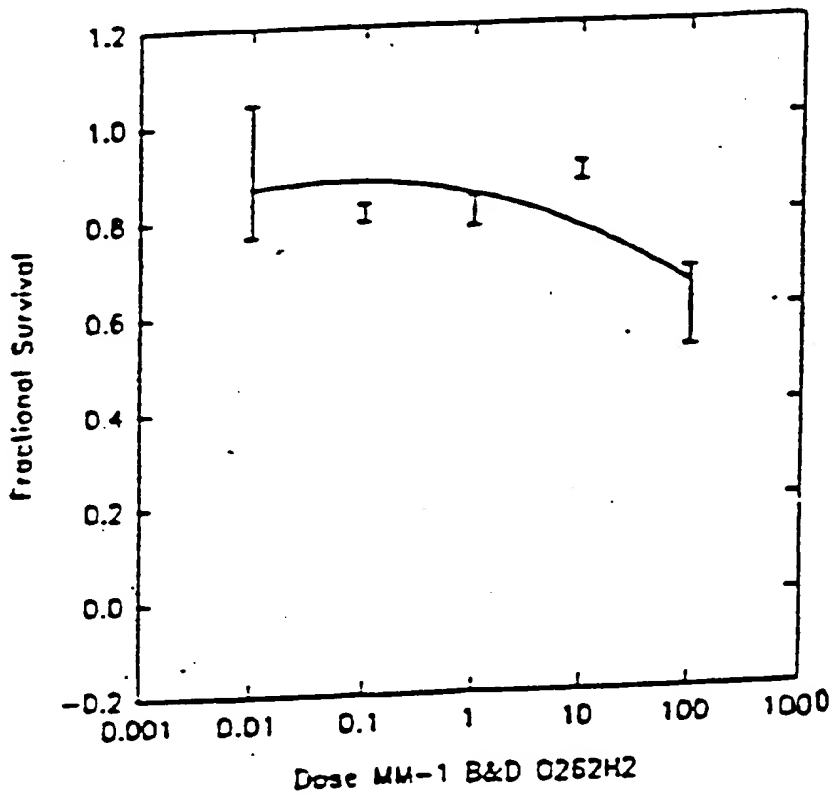


Figure 9G

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Representative Procyanidin Fraction Combinations

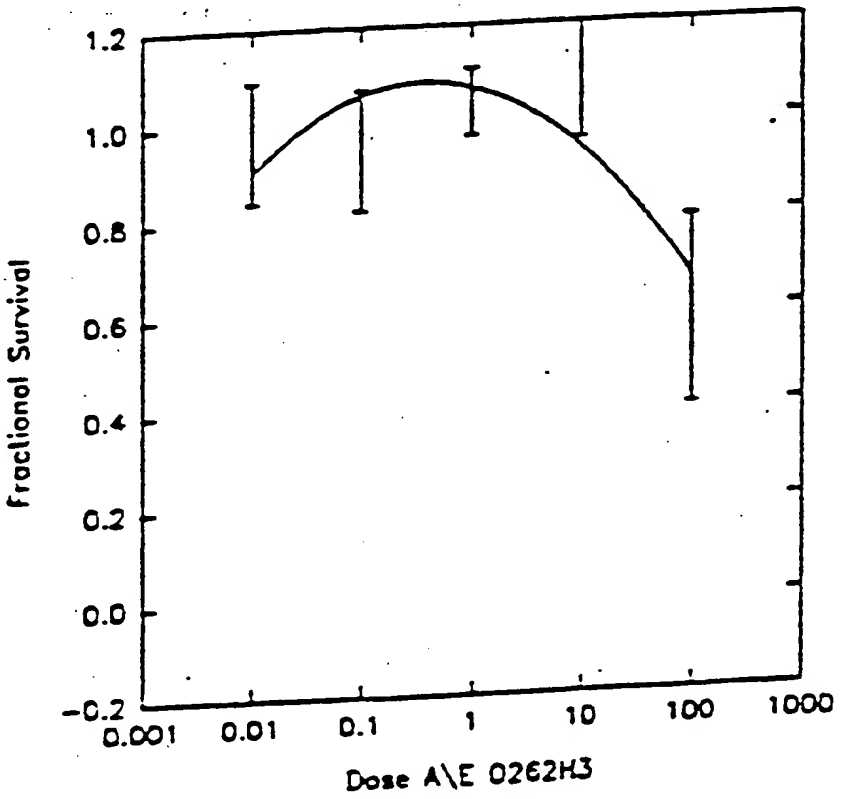


Figure 9H Dose-Response Relationships Between Cocoa Procyanidin Fractions and the HCT-116 Cell Line

Representative Procyanidin Fraction Combinations

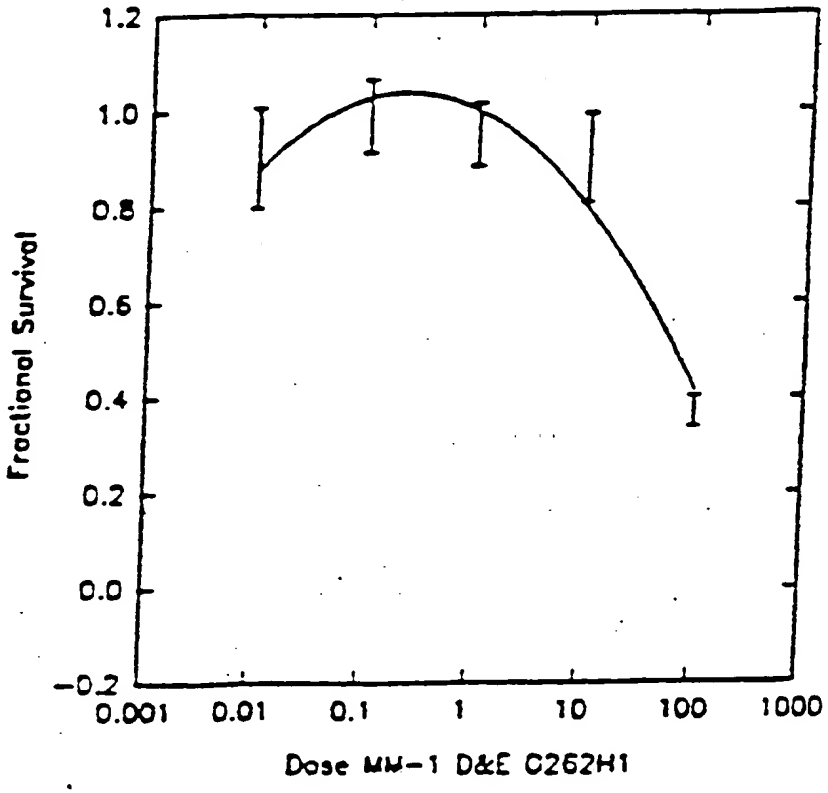


Figure 10A Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Individual Procyanidin Fractions

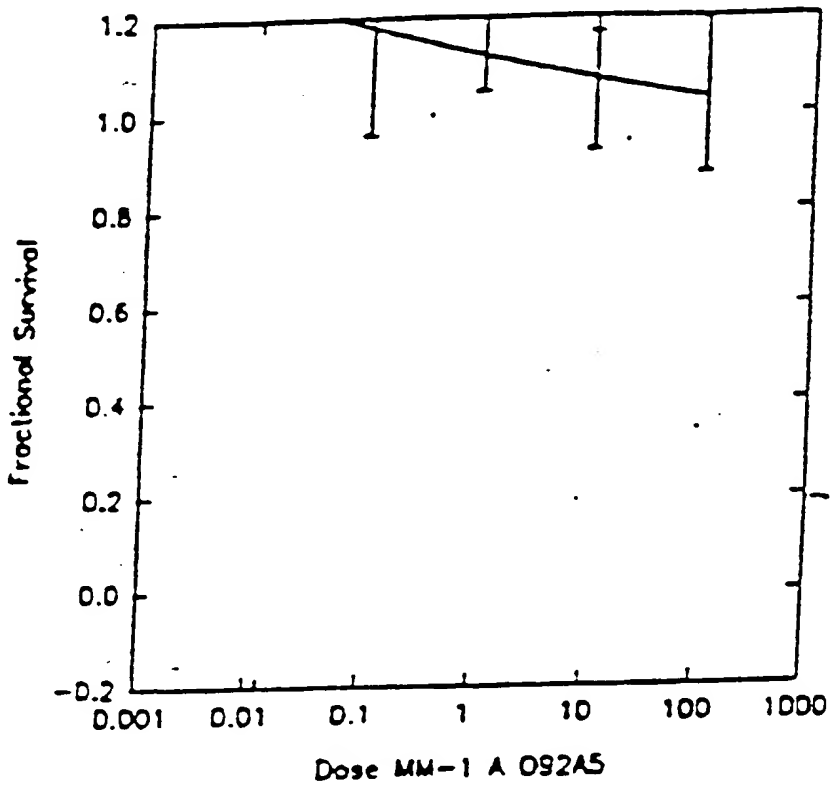


Figure 10B

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Individual Procyanidin Fractions

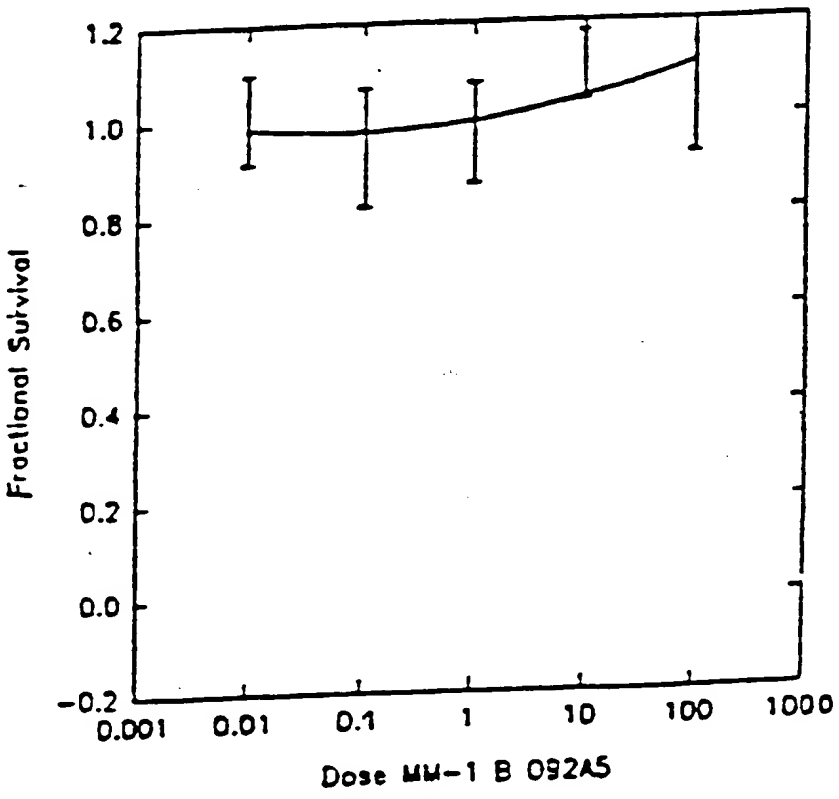


Figure 10C

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Individual Procyanidin Fractions

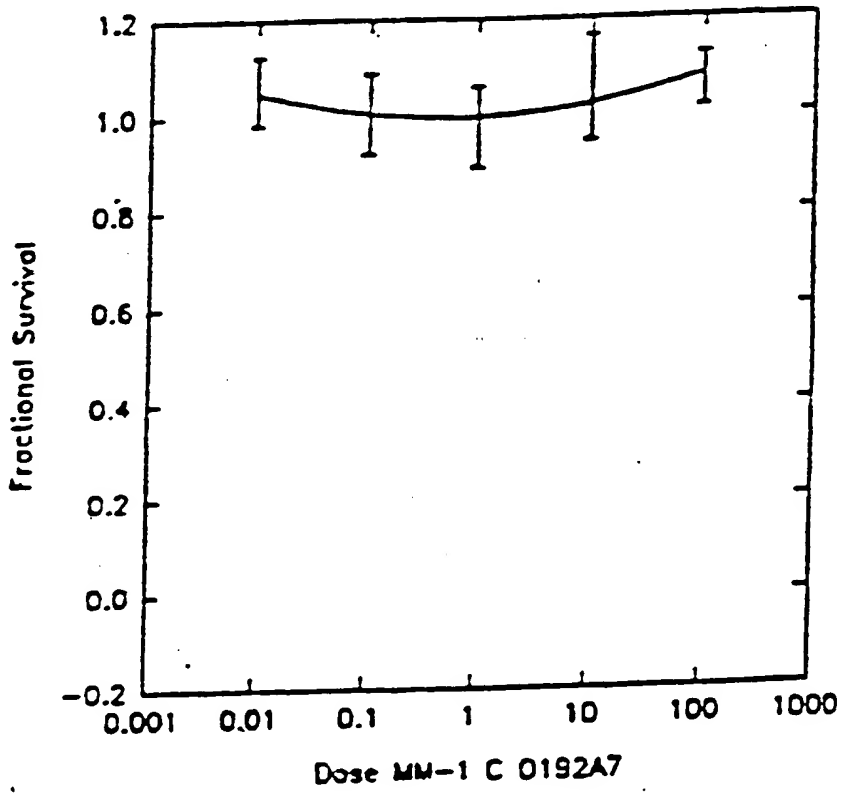


Figure 10D

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Individual Procyanidin Fractions

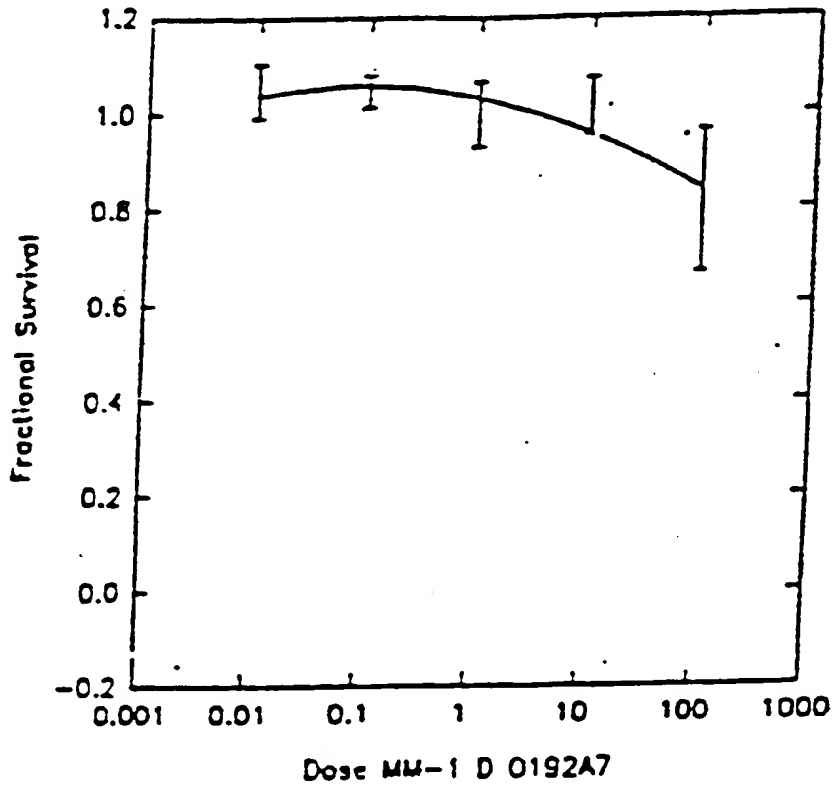


Figure 10E

Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Individual Procyanidin Fractions

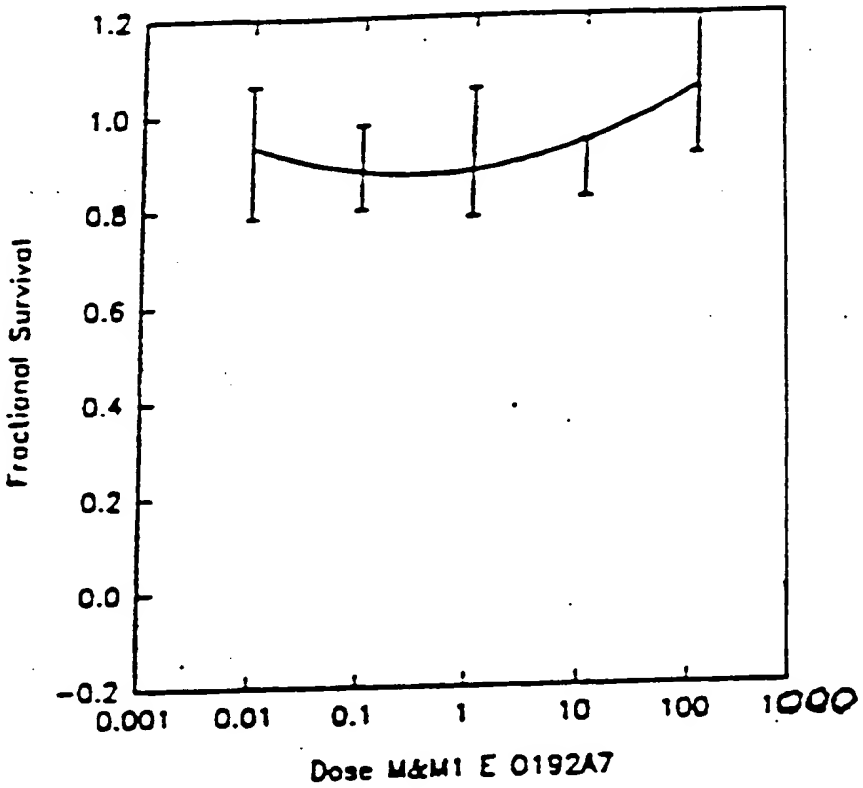


Figure 10F Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Representative Procyanidin Fraction Combinations

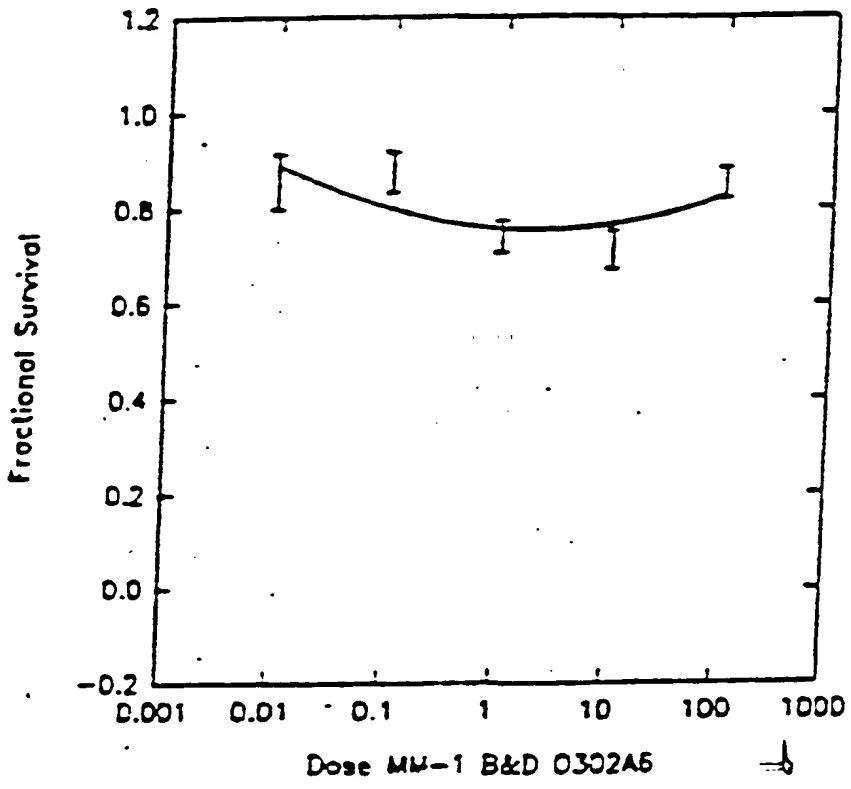


Figure 10G Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Representative Procyanidin Fraction Combinations

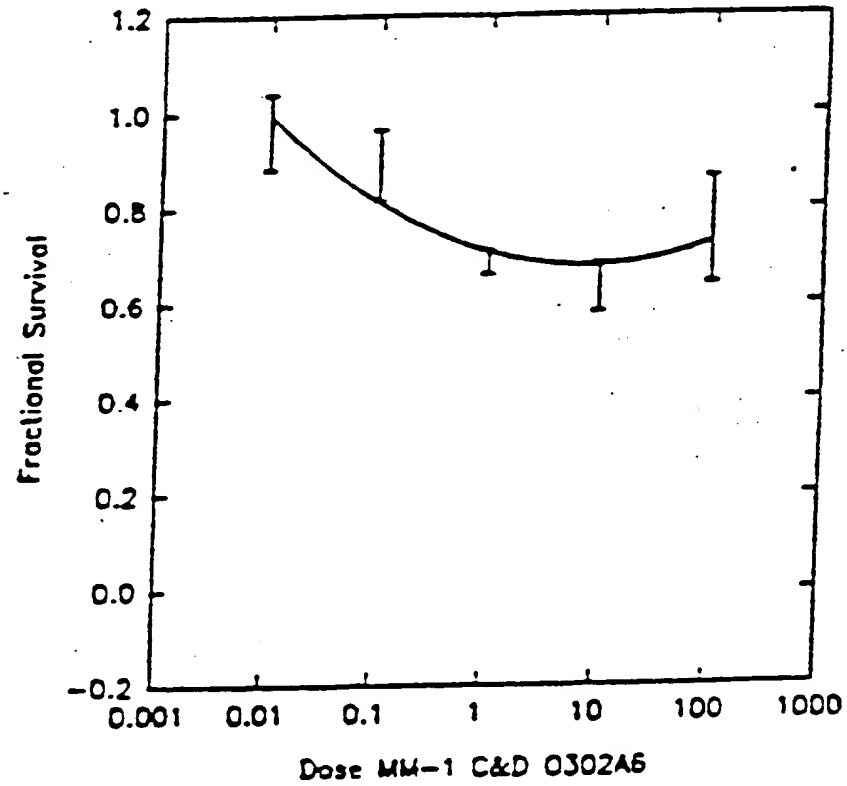


Figure 10H Dose-Response Relationships Between Cocoa Procyanidin Fractions and the ACHN Renal Cell Line

Representative Procyanidin Fraction Combinations

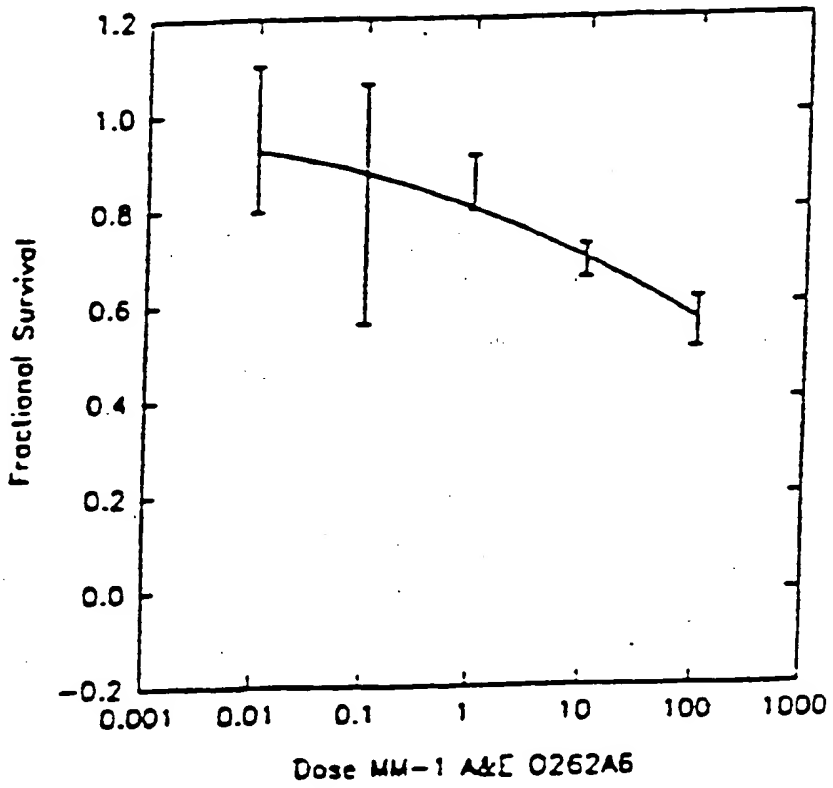


FIGURE 14

Dose-Response Relationships Between Cocoa Procyanidin Fraction D and the CCRF-CEM T-Cell Leukemia Cell Line

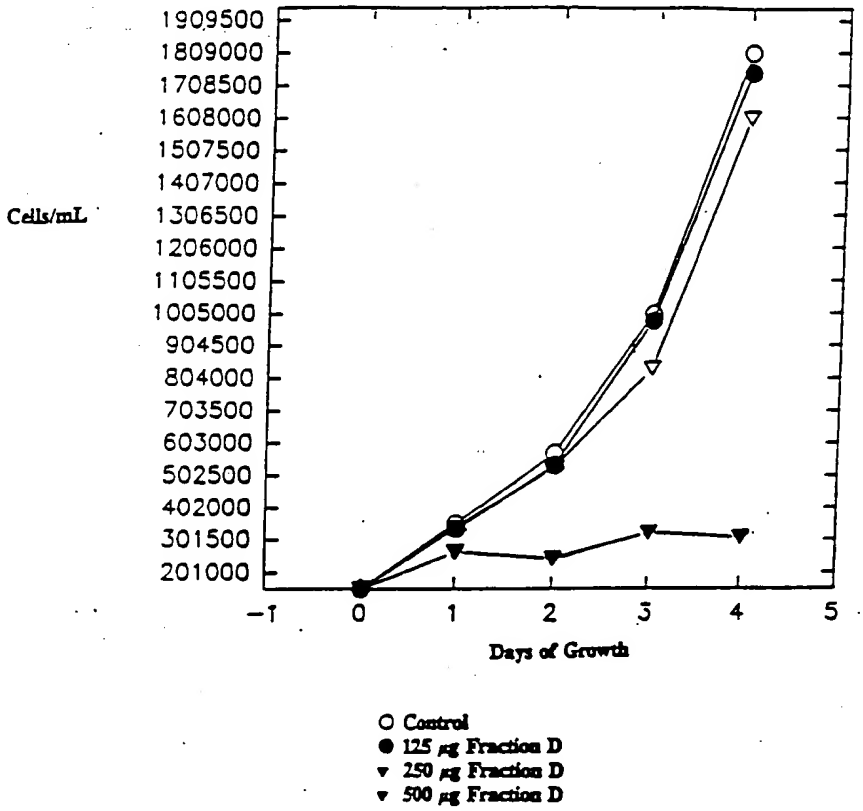


Figure 15 A: Comparison of XTT and Crystal Violet Cytotoxicity Assays on MCF - 7 p168 cells Treated with Fraction D + E

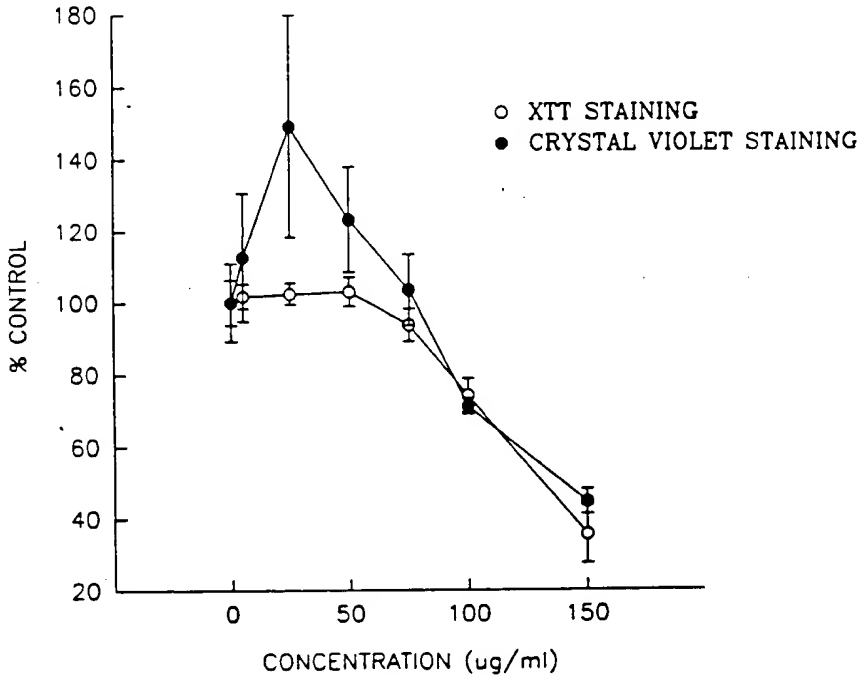
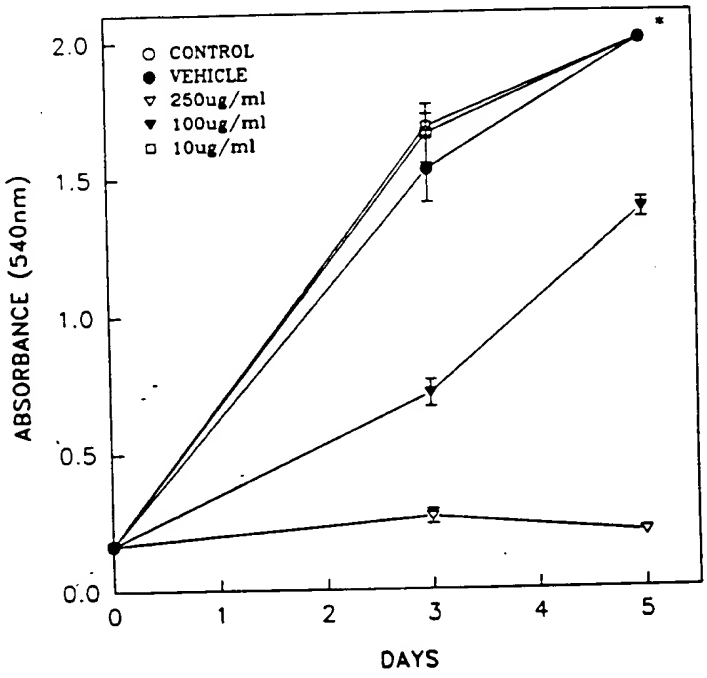


Figure 15 B: Dose Response for UIT-1 Crude Polyphenol Extract on MDA MB 231 Cells



* NOTE: ABSORBANCE OF 2.0 INDICATES THE MAXIMUM ABSORBANCE OF THE PLATE READER. IT IS NOT REPRESENTITVE OF CELL NUMBER.

Figure 15 C: Dose Response for UIT-1 Crude Polyphenol Extract on PC-3 Cells

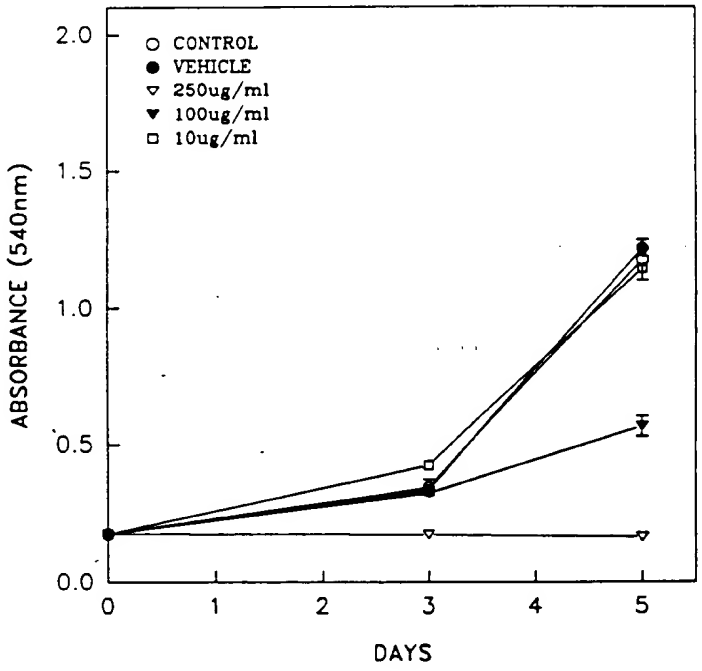
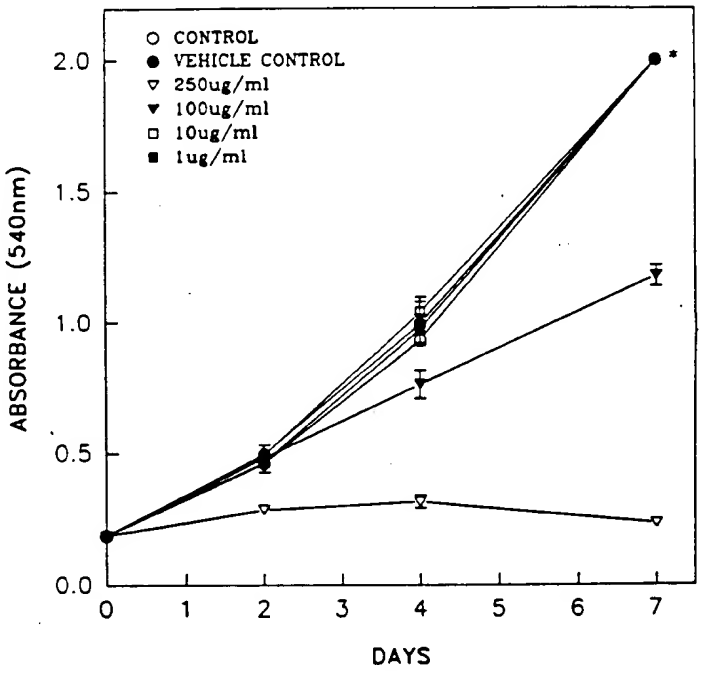
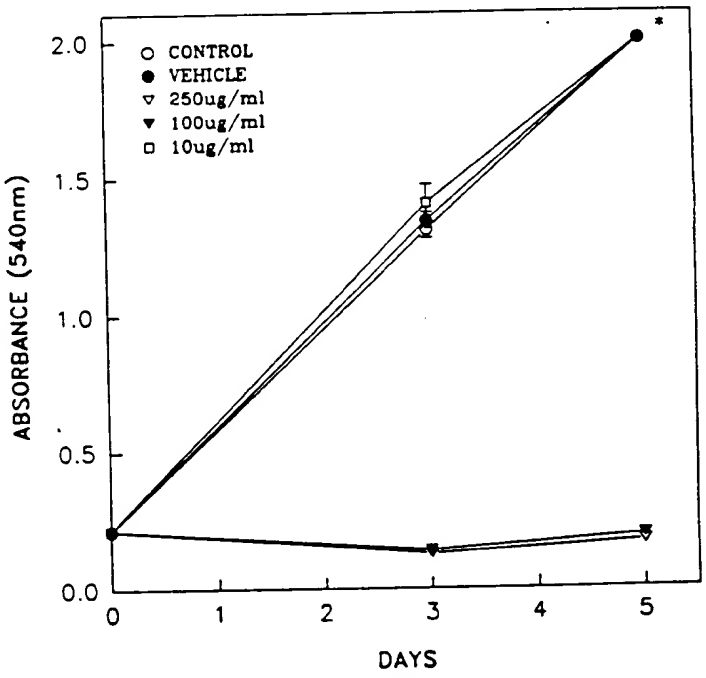


Figure 15 D: Dose Response for UIT-1 Crude Polyphenol Extract on MCF-7 p168 Cells



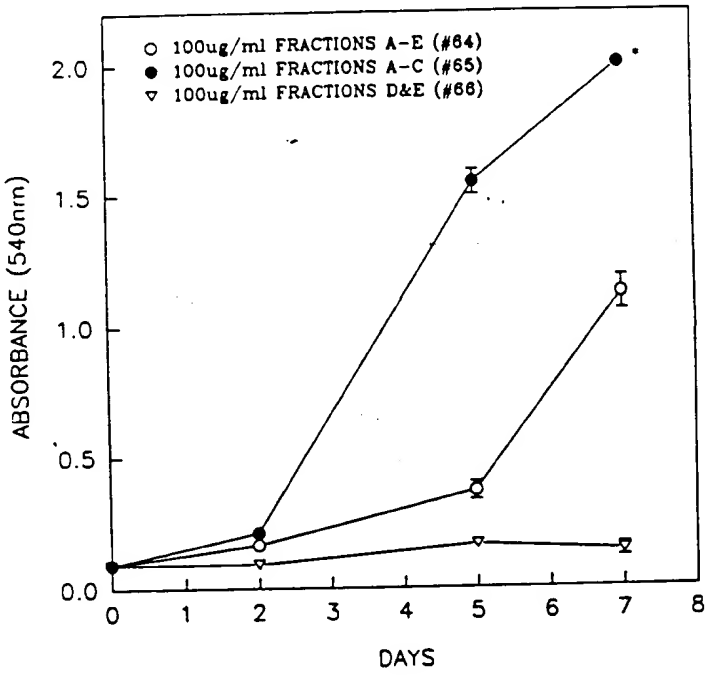
* NOTE: ABSORBANCE OF 2.0 INDICATES THE MAXIMUM ABSORBANCE OF THE PLATE READER. IT IS NOT REPRESENTATIVE OF CELL NUMBER.

Figure 15 E: Dose Response for UIT-1 Crude Polyphenol Extract on Hela Cells



* NOTE: ABSORBANCE OF 2.0 INDICATES THE MAXIMUM ABSORBANCE OF THE PLATE READER. IT IS NOT REPRESENTITVE OF CELL NUMBER.

Figure 15 F: Cytotoxicity of Cocoa Fractions at 100μL/mL on Hela Cells



• NOTE: ABSORBANCE OF 2.0 INDICATES THE MAXIMUM ABSORBANCE OF THE PLATE READER. IT IS NOT REPRESENTATIVE OF CELL NUMBER.

Figure 15 G: Cytoxicity Of Cocoa Fractions at 100μL/mL on SKBR - 3 Cells

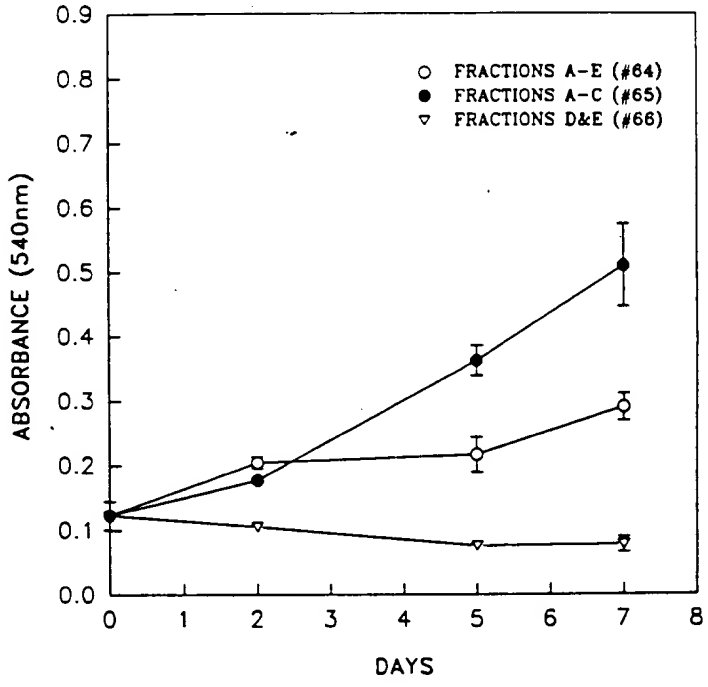
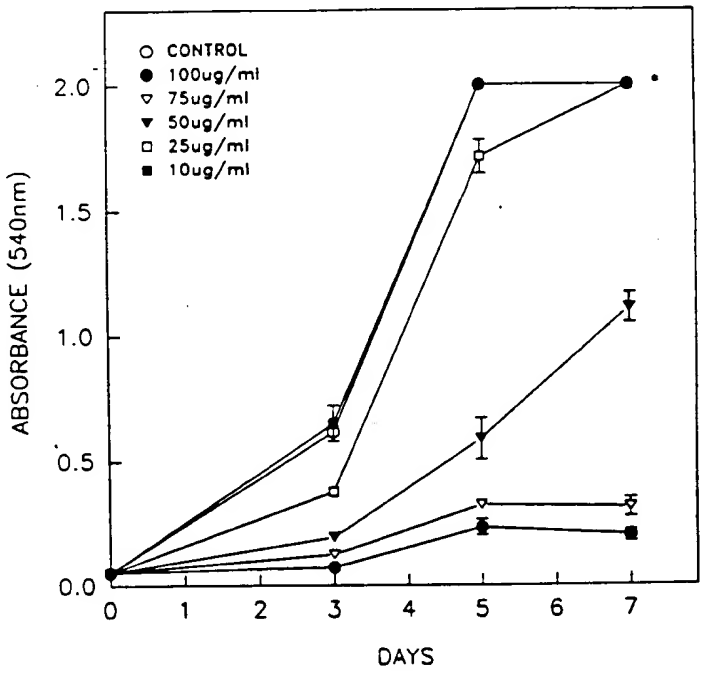


Figure 15 H: **Dose Response for Cocoa Fraction D + E on Hela Cells**



• NOTE: ABSORBANCE OF 2.0 INDICATES THE MAXIMUM ABSORBANCE OF THE PLATE READER. IT IS NOT REPRESENTATIVE OF CELL NUMBER.

Figure 15 I: Dose Response for Cocoa Fraction D + E on SKBR - 3 Cells

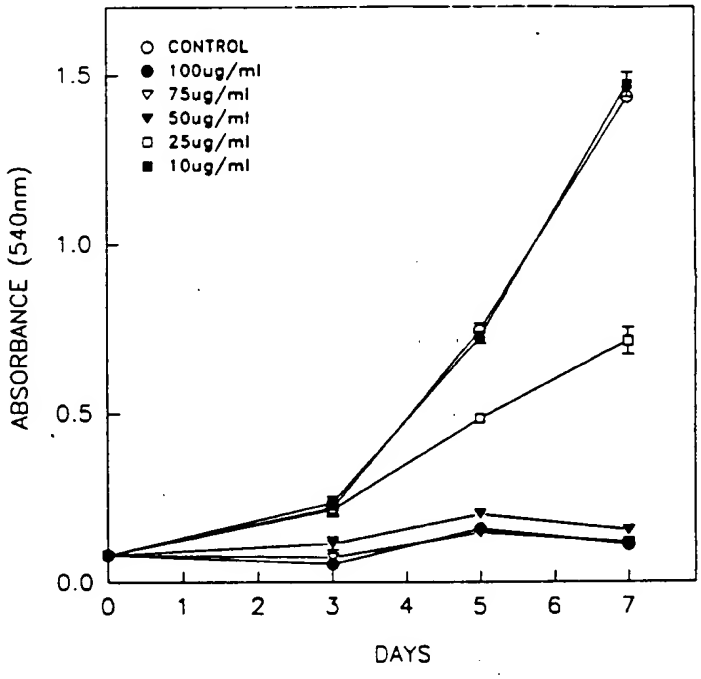


Figure 15 J: Dose Response for Cocoa Fraction D + E on Hela Cells by Soft Agar Cloning Assay

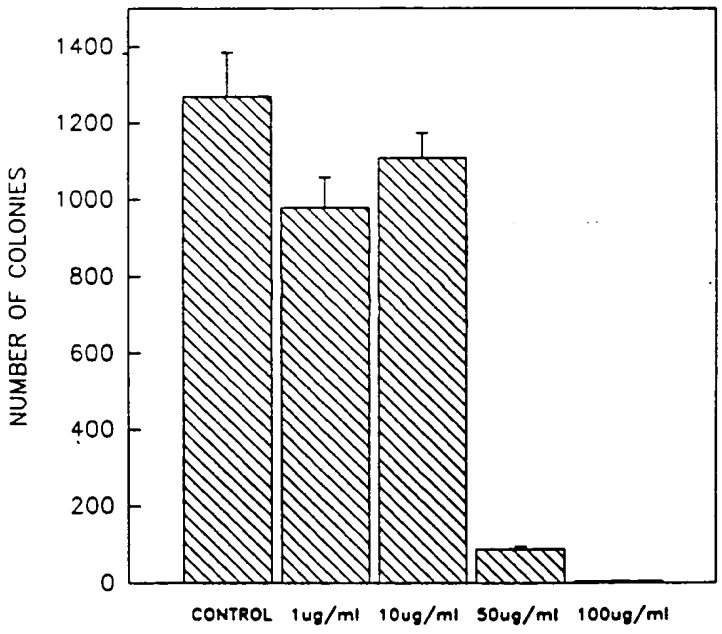
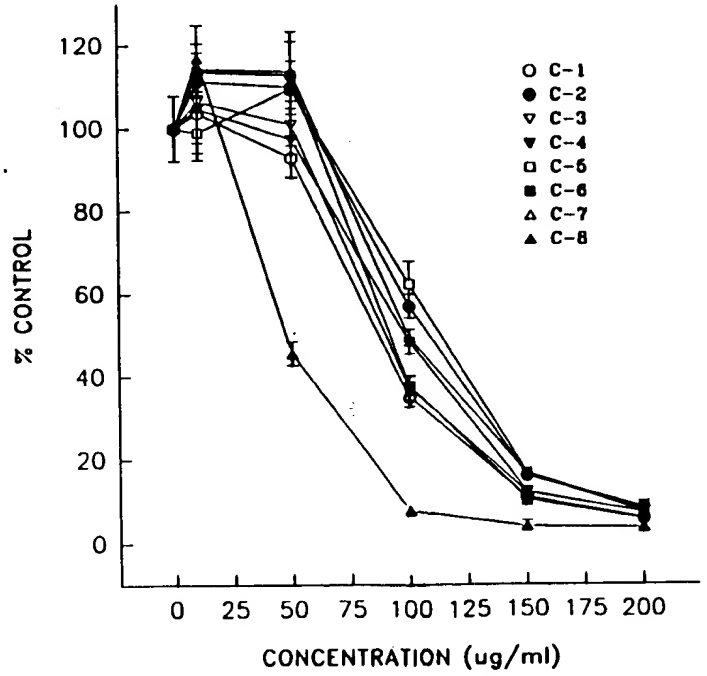


Figure 15 K: **Growth Inhibition of Hela Cells by Crude Cocoa Extracts Prepared from Different Cocoa Genotypes**



#	GENOTYPE	HORTI. RACE	DESCRIPTION
C-1	UF-12	CRIOLLO	CRUDE EXTRACTS OF UF-12 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-2	NA-33	FORASTERO	CRUDE EXTRACTS OF NA-33 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-3	EEG-48	FORASTERO	CRUDE EXTRACTS OF EEG-48 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-4	UNKNOWN	FORASTERO	CRUDE EXTRACTS OF UNKNOWN (W. AFRICAN) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-5	UF-613	TRINITARIO	CRUDE EXTRACTS OF UF-613 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-6	ICS-100	TRINITARIO	CRUDE EXTRACTS OF ICS-100 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-7	ICS-139	TRINITARIO	CRUDE EXTRACTS OF ISC-139 (BRAZIL) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)
C-8	UIT-1	TRINITARIO	CRUDE EXTRACTS OF UIT-1 (MALAYSIA) COCOA POLYPHENOLS (DECAFFEINATED/DETHREOBROMINATED)

Figure 15 L: **Growth Inhibition of Hela Cells by Cocoa Polyphenol Extracts Taken at Different Time Stages Throughout a Fermentation and Sun Drying Stage**

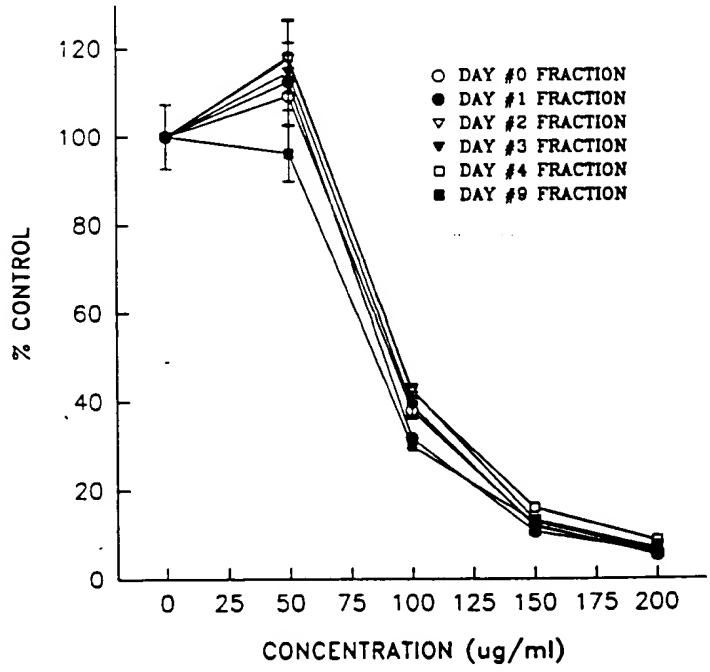


Figure 15 M: Dose Response for Polyphenol Oxidase Treated Crude Cocoa Polyphenol Extract

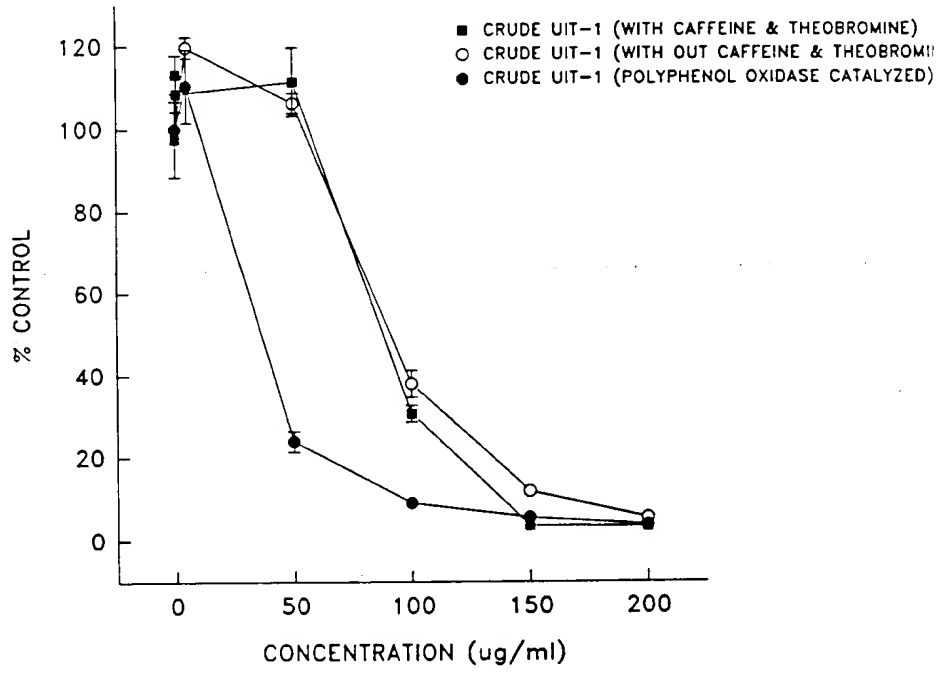


Figure 15 N: **Reverse Phase Semi-Preparative HPLC Separation of Fraction D + E**

HPLC Conditions: 60 x 10 mm 10u Phenomenex Ultracarb ODS (20) guard column; 250 x 22.5 mm 10u Phenomenex Ultracarb ODS (20) preparatory column

Gradient (Time, %A): (0.85), (60, 50), (90,0), (110,0) where A=H_2O, and B=MEOH

Detector: HP1050 Mutiwavelength detector @ 254nm
Recorder: Kipp & Zonan BD41
Collector: Pharmacia Frac 100
Flow rate: 5 mL/min

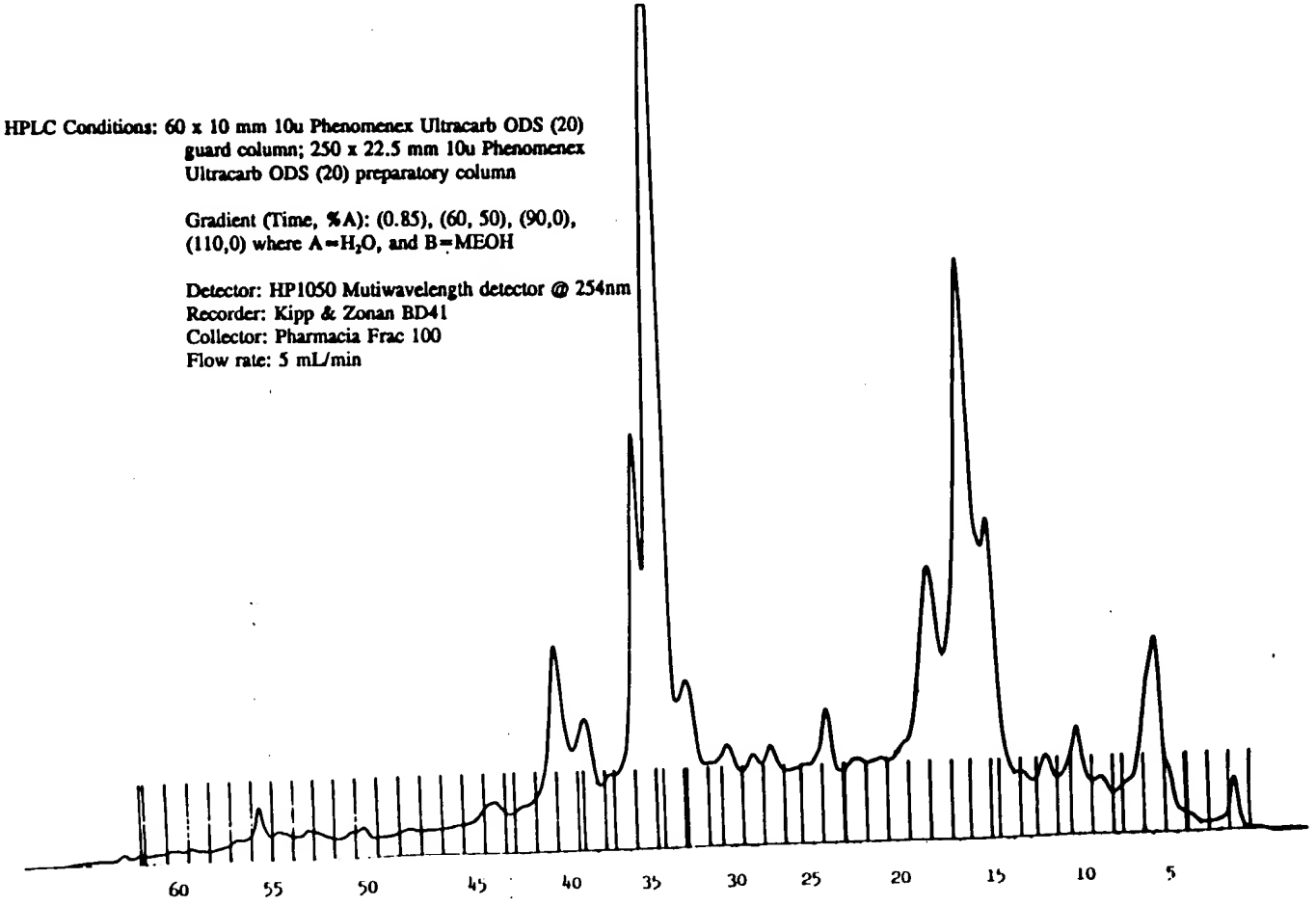
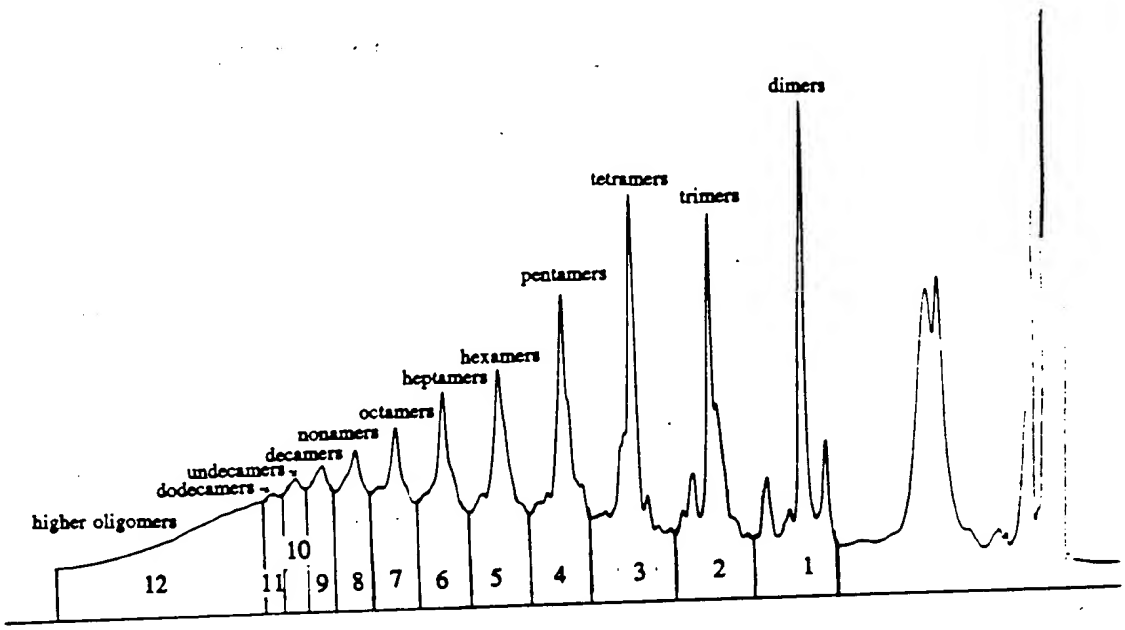


Figure 15 O: Normal Phase Semi-Preparative HPLC Separation of a Crude Cocoa Polyphenol Extract



HPLC Conditions: 250 x 10mm Supelcosil LC-Si (5μm) Semipreparative Column
20 x 4.6mm Supelcosil LC-Si (5μm) Guard Column
Gradient:

Time (min)	CH_2Cl_2	Methanol	Acetic Acid/H_2O (1:1)
0	82	14	4
30	67.6	28.4	4
60	46	50	4
65	10	86	4
70	10	86	4

Detector: Waters LC Spectrophotometer Model 480 @ 254nm
Flow rate: 3mL/min, ambient temperature
250μL of 70% aqueous acetone extract injected

Figure 16. Rancimat Oxidation Curves for Cocoa Procyanidins and Synthetic Antioxidants

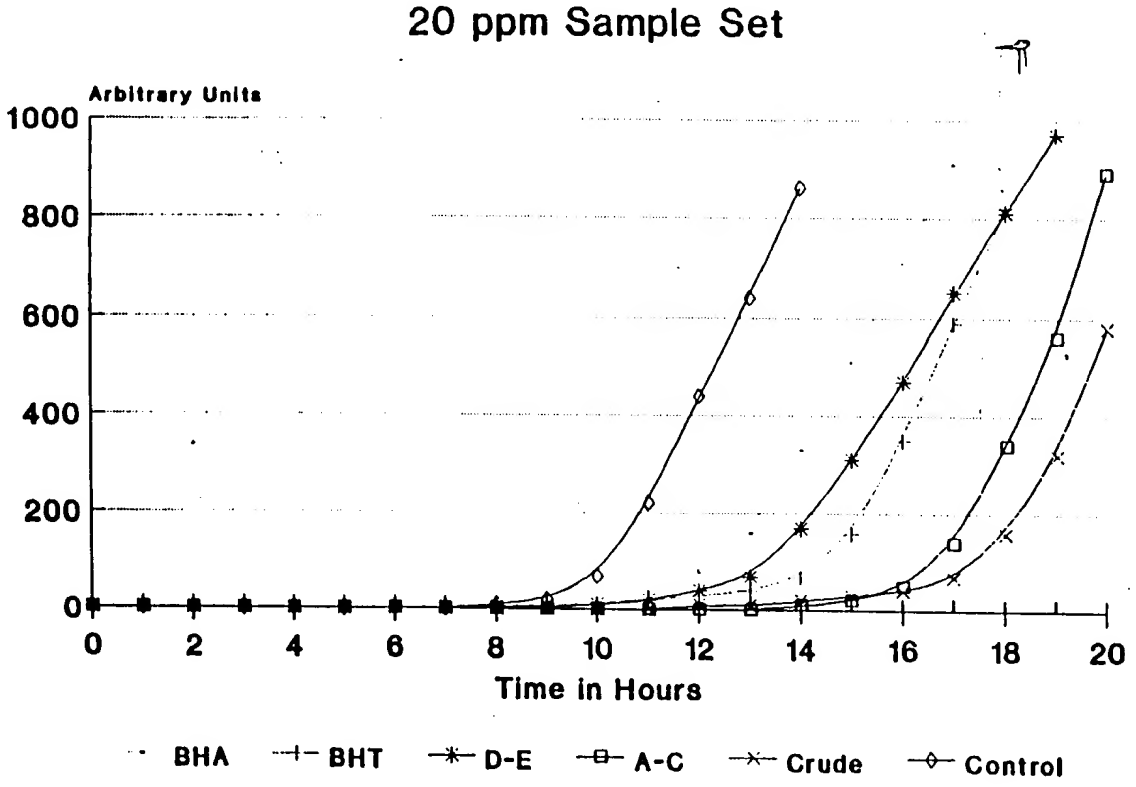
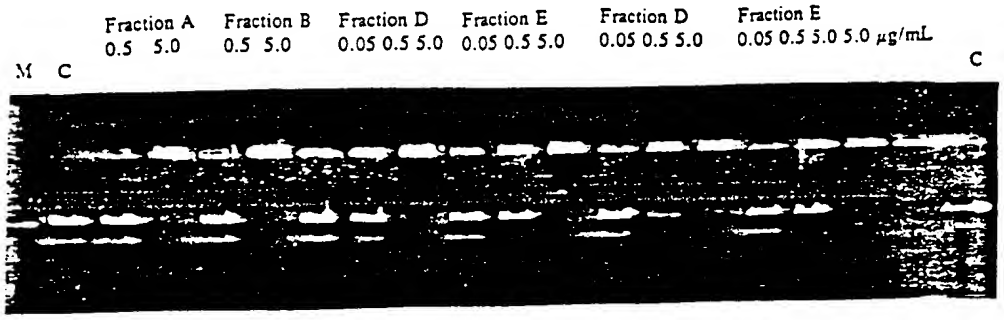


Figure 17. Inhibition of Topoisomerase II Catalyzed Decatenation of Kinetoplast DNA by Cocoa Procyanidin Fractions



Lane 1 contains 0.5μg of marker (M) monomer-length kinetoplast DNA circles
Lanes 2 and 20 contain kinetoplast DNA that was incubated with Topoisomerase II in the presence of 4% DMSO, but in the absence of any cocoa procyanidins. (Control -C)
Lanes 3 and 4 contain kinetoplast DNA that was incubated with Topoisomerase II in the presence of 0.5 and 5.0 μg/mL cocoa procyanidin fraction A.
Lanes 5 and 6 contain kinetoplast DNA that was incubated with Topoisomerase II in the presence of 0.5 and 5.0 μg/mL cocoa procyanidin fraction B.
Lanes 7,8,9,13,14,and 15 are replicates of kinetoplast DNA that was incubated with Topoisomerase II in the presence of 0.05,0.5 and 5.0 μg/mL cocoa procyanidin fraction D.
Lanes 10,11,12,16,17, and 18 are replicates of kinetoplast DNA that was incubated with Topoisomerase II in the presence of 0.05,0.5 and 5.0 μg/mL cocoa procyanidin fraction E.
Lane 19 is a replicate of kinetoplast DNA that was incubated with Topoisomerase II in the presence of 5.0 μg/mL cocoa procyanidin fraction E.

Figure 18. Dose Response Relationships Between Cocoa Procyanidin Fraction D and DNA Repair Competent and Deficient Cell Lines

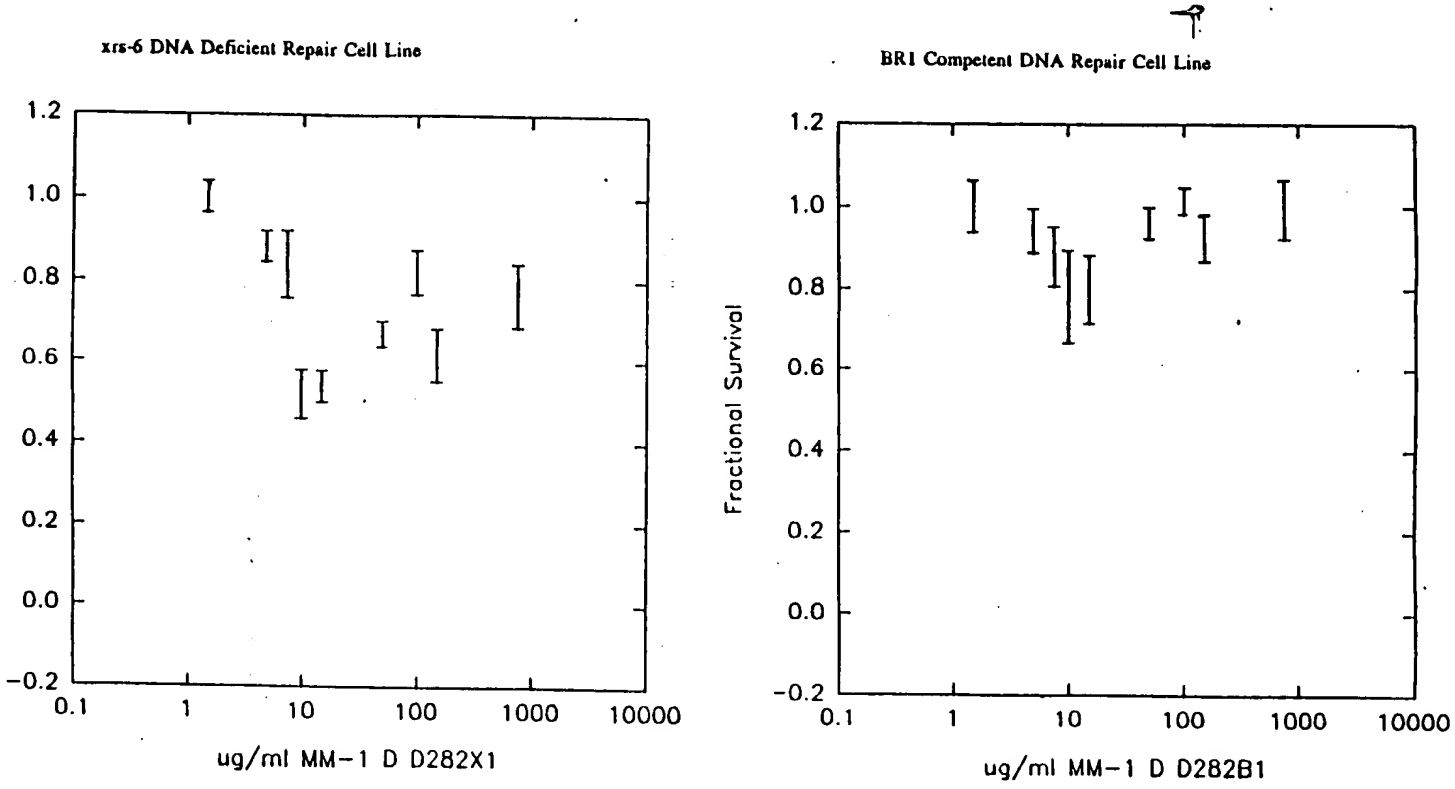


Figure 19: Dose Response Curve for Adriamycin Resistant MCF-7 Cells in Comparison to MCF-7 p168 Parental Cell Line with Cocoa Fraction D + E

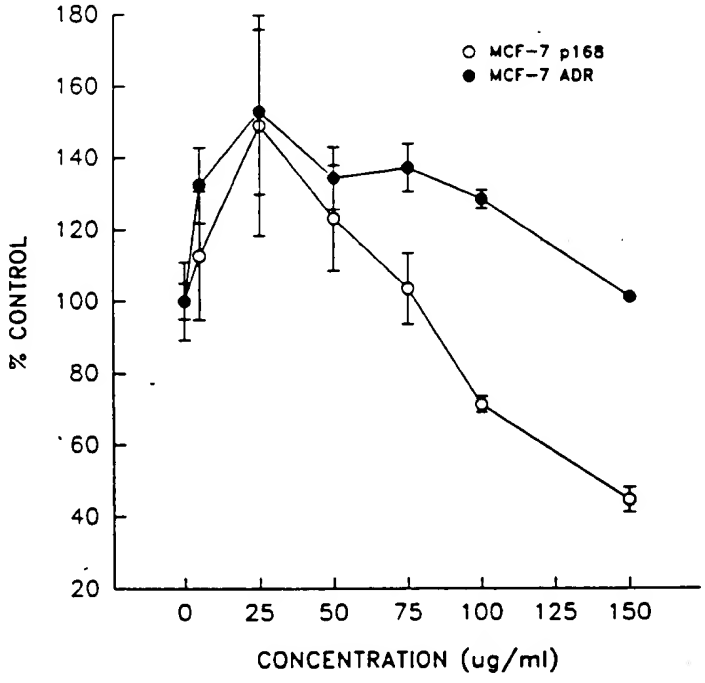


Figure 20: **Dose Response Effect on Hela by Normal Phase Fractions**